Problem A. Automatic Sprayer 2

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	1024 megabytes

A farm is divided into $n \times n$ unit squares of n rows and n columns. Let's define (i, j) as the unit square in the i-th row and the j-th column ($1 \le i \le n$, $1 \le j \le n$).

The distance between two squares (i_1, j_1) and (i_2, j_2) is defined to be $d((i_1, j_1), (i_2, j_2)) = |i_1 - i_2| + |j_1 - j_2|$, the Manhattan distance between those two squares.

There are automatic sprayers on this farm that spray fertilizer solution or herbicide so that the owner can produce grain efficiently.

Each sprayer lies entirely in a unit square. The sprayer in (x, y) sprays $A_{x,y}$ liters of solution to all unit squares. $A_{x,y}$ can be any nonnegative integer.

The energy required for the sprayer in (x, y) to spray solution to (i, j) is exactly $d((x, y), (i, j)) \times A_{x,y}$. For each square (i, j), we compute $E_{i,j}$, the sum of energies needed for all sprayers to spray the square (i, j).

Given the matrix E, write a program that generates *any possible* matrix A that corresponds to matrix E. E will be given such that there exists such a matrix A of nonnegative integers whose sum is at most 10^{12}.

Input

The first line contains a single positive integer n ($2 \le n \le 1\,000$).

The next n lines each contain n integers. The j-th ($1 \le j \le n$) integer in the i-th ($1 \le i \le n$) line is $E_{i,j}$ ($0 \le E_{i,j} \le 10^{16}$).

The input is designed such that a matrix A consisting of only non-negative integers whose sum is at most 10^{12} exists which can yield E.

Output

Output n lines, each containing n integers. The y-th ($1 \le y \le n$) integer in the x-th ($1 \le x \le n$) line should be $A_{x,y}$.

Examples

standard input	standard output
5 4 3 2 3 4 3 2 1 2 3 2 1 0 1 2 3 2 1 2 3 4 3 2 3 4	0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
6 43 34 25 24 33 42 42 33 24 23 32 41 41 32 23 22 31 40 40 31 22 21 30 39 39 30 21 20 29 38 48 39 30 29 38 47	0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 0 0 0 0 0 0 0 0

Problem B. Cilantro

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 seconds
Memory limit:	1024 megabytes

Junwon Kim runs a Vietnamese noodle restaurant in *Sharosu-gil*, a street near Seoul National University which is home to trendy gourmets.

Junwon sells two kinds of noodles: one with cilantro, and one without. Today, he will cook n batches of noodles. Junwon has a fixed schedule cooking the noodles, represented by a length-n string S. If the i-th character of S is `Y`, then the i-th dish Junwon cooks will have cilantro. Otherwise, it will not have cilantro.

Since Junwon's restaurant is very famous, n customers are already waiting in line to experience his ultimate noodles. The customers' preferences are also represented by a length-n string T. If the i-th character of T is `Y`, then the i-th customer wants noodles with cilantro. Otherwise, the i-th customer wants noodles without cilantro.

Junwon has to serve each customer in a first-come-first-serve manner. In this regard, the i-th customer should receive the i-th dish. However, this may violate the preference of the customer. To solve this problem, Junwon installed noodle storage. The noodle storage stores noodles as a stack: you can only access the noodles that were inserted most recently. Junwon will put all cooked noodles right into the noodle storage, and serve the noodles only from the noodle storage. If Junwon decided to serve the noodles from the storage, then he must serve the topmost noodles - he cannot rearrange the noodles in any way after they are added to the stack.

To summarize, when the i-th customer orders noodles, Junwon will cook 0 or more batches of noodles, put them in the noodle storage, and then serve the noodle at the top of the noodle storage. Junwon should schedule the cooking in a way such that every customer receives the noodles that they want. Note that Junwon can't cook more than n noodles.

Today is a bad day for Junwon, because the infamous Jaehyun Koo is the first customer today. Jaehyun is known for his toxic online food reviews, where he sometimes goes so far that the restaurant should stop creating ~~shit problems~~ food and go out of business.

Junwon thinks the quality of his noodles are uneven. Therefore, he wants to know which dishes have a possibility to be served to Jaehyun, while satisfying the condition that every customer receives a menu that they ordered. Please print the `sum of indices` of dishes that can be served to Jaehyun. Dishes are 1-indexed. If there is no way to serve dishes, output 0.

Input

The first line contains a single integer n ($1 \le n \le 5\,000\,000$).

The next line contains a length-n string S. All characters of S are either `Y` or `N`.

The next line contains a length-n string T. All characters of T are either `Y` or `N`.

Output

Output a single integer denoting the answer of the problem.

Examples

standard input	standard output
3 YNN NNY	5
4 NYNY YNNY	2

Problem C. Equivalent Pipelines

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	1024 megabytes

You are planning to construct a water pipeline network, connecting n buildings in KAIST. Due to budget problems, you can only use $n-1$ pipes. Each pipe is undirected and connects two different buildings, and all n buildings must be pairwise connected through some sequence of pipes. These pipes form a network.

As a careful planner, you designed d different networks and want to compare them. One can describe each pipe in the network with a durability, which is a single positive integer. Given a network T, define the **vulnerability** $v_T(i,j)$ of two distinct buildings i and j to be the minimum durability of a pipe whose removal separates buildings i and j. In other words, $v_T(i,j)$ is the minimum durability over all pipes on the path connecting i to j.

If two networks T_1 and T_2 satisfy $v_{T_1}(i,j) = v_{T_2}(i,j)$ for all $1 \le i < j \le n$, we say T_1 and T_2 are **equivalent**. To filter out unnecessary plans, group the d designs up to equivalency.

Input

The first line contains two integers d and n ($d \ge 1$, $n \ge 2$, $d \cdot n \le 500\,000$), separated by a space.

From the second line, the descriptions for the d designs are given. Each design is described over $n-1$ lines, each line consisting of three integers a, b and c ($1 \le a, b \le n$, $a \ne b$, $1 \le c \le 10^9$), indicating there is a pipe connecting buildings a and b directly, whose durability is equal to c.

Output

Output d integers in a line. For $1 \le i \le d$, the i-th number should be the minimum index j, where the j-th network in the input is equivalent to the i-th network in the input.

Examples

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

Problem D. Flowerbed Redecoration

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	1024 megabytes

Joon-Pyo decorated a flowerbed in front of his home. The flowerbed is in the shape of an $n \times m$ grid, and one flower is planted in each cell. There are 26 colors, one corresponding to each uppercase letter from A to Z. Suddenly, he wanted to redecorate the flowerbed.

The flowerbed is too large to adjust the flowers one by one. He rented some equipment that can lift and rotate a square plot of land with a side length of d. He planned the construction in the following order, expecting the flowerbed to be properly redecorated.

1. Place the equipment so that exactly the flowers in the first d rows and the first d columns are inside.
2. Rotate the $d \times d$ square inside the equipment 90° clockwise. If this square contains flowers from the last d rows and the last d columns, then the construction is finished. Otherwise, if this square does not contain flowers in the last d columns, move the equipment x squares to the right. Otherwise, move the equipment down by y squares and all the way to the left so it contains flowers from the first d columns.
3. Repeat step 2 until construction is finished.

Note that the equipment will never go out of the flowerbed, as x, y, and d are carefully determined before construction begins.

He cannot start construction without knowing the outcome. Write a program that outputs the result.

Input

On the first line, five integers n, m, y, x, and d are given. ($1 \le n \times m \le 10^6$, $1 \le y \le n$, $1 \le x \le m$, $1 \le d \le \min(n, m)$, $\boldsymbol{n \equiv d \pmod{y}}$, $\boldsymbol{m \equiv d \pmod{x}}$).

Each of the next n lines contains exactly m uppercase letters, the current flowerbed.

Output

Output n lines, each containing m uppercase letters, the flowerbed after the planned construction.

Examples

standard input	standard output
4 4 1 1 2 AAAA BBBB AAAA BBBB	BAAA ABBB BAAA BBBA
6 5 1 2 3 RBRCY YBPBR PBRCY CYPBR PBRCY CYPBR	PYRBR CRCBB PPBPY CRCYB YRBCY PYRBR

Problem E. Goose Coins

Input file:	standard input
Output file:	standard output
Time limit:	3 seconds
Memory limit:	1024 megabytes

The Goose Kingdom uses n types of goose coins as their national currency. The i-th type of goose coin has a value of c_i goose-dollars and a weight of w_i. For all i $(1 \le i \le n-1)$, c_{i+1} is a multiple of c_i and $c_i < c_{i+1}$.

You visited Goose Market and bought p goose-dollars worth of goods. You want to pay the exact price using exactly k goose coins. You have infinitely many coins of each type, so you don't have to worry about running out of coins.

Write a program to find the minimum and maximum possible total weights of k coins with total value of p goose-dollars. If there is no such set of coins, output -1.

Input

The first line contains three integers n, k, and p $(1 \le n \le 60, 1 \le k \le 10^3, 1 \le p \le 10^{18})$. n is the number of types of goose coins. k is the number of coins you have to use to make exactly p goose-dollars.

In the following n lines, the i-th line contains two integers c_i $(1 \le c_i \le 10^{18})$ and w_i $(1 \le w_i \le 10^{15})$, representing the value and the weight of the i-th type of goose coin.

For all i $(1 \le i \le n-1)$, c_{i+1} is a multiple of c_i and $c_i < c_{i+1}$.

Output

If it is possible to pay exactly p goose-dollars using exactly k goose coins, output the minimum and maximum possible total weights of the k coins. Otherwise, output -1.

Examples

standard input	standard output
3 9 20 1 2 2 5 6 10	37 44
2 5 10 1 1 3 3	-1

Problem F. Hedgehog Graph

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	1024 megabytes

A *hedgehog graph* is a directed graph where each vertex has exactly one outgoing edge and contains exactly one directed cycle of length at least 3 (the graph does not contain a loop or cycle of length 2.) For every edge $e = u \to v$ in the hedgehog graph, v belongs to the aforementioned single directed cycle.

For a vertex v, if there exists an edge $v \to w$, we denote the vertex $w = next(v)$ as the *next vertex*. This vertex exists and is unique.

Kipa has n hedgehog graphs with 10^6 vertices. Each vertex is numbered from 1 to 10^6. Kipa is not given the graph directly. Instead, Kipa can ask the following query at most 900 times.

- `? v x`: Given a vertex v and a positive integer x, the jury starts at v, moves to the next vertex x times, and returns the index of the resulting vertex. ($1 \le v \le 10^6, 1 \le x \le 5 \times 10^{18}$)

Your task is to help Kipa determine the length of the directed cycle for each hedgehog graph.

Output

First, your program must read from the standard input one line with the positive integer n, the number of graphs to process. n will be at most 10.

For each graph, the program can ask the following query at most 900 times.

- `? v x`: Given a vertex v and a positive integer x, the jury starts at v, moves to the next vertex x times, and returns the index of the resulting vertex. ($1 \le v \le 10^6, 1 \le x \le 5 \times 10^{18}$)

Once you have determined the length of the cycle s, output `! s`. After that, read a single integer which is either:

- 1, if the answer is correct. You should immediately start processing the next graph, or finish your program with the exit code 0 if all n graphs are processed.
- -1, if the answer is incorrect. In this case, you should finish your program with exit code 0, in which case you will receive a Wrong Answer verdict. Failure to handle this properly may result in unexpected behavior.

You must flush your output after every interaction.

The interactor is adaptive. In other words, the interactor does not necessarily start with a fixed graph at the beginning of the interaction. The interactor only guarantees that there exists at least one hedgehog graph that satisfies all the provided responses of the interactor and the input specification.

Example

standard input	standard output
1 3 7 10 1	 ? 1 2 ? 2 5 ? 10 11 ! 11

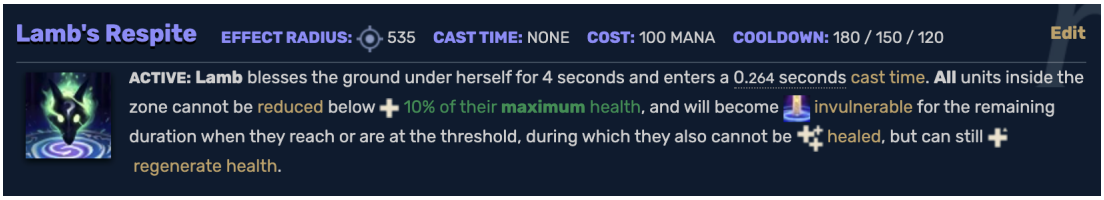
Problem G. Lamb's Respite

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	1024 megabytes

Wookje is playing the game *League of Legends*, where two teams of players fight against each other. Each player manages a champion whose status can be represented by two integers: the *health* h, and the *maximum health* H. If a champion's health is less than or equal to zero ($h \le 0$), the champion dies and leaves the game immediately with $h = 0$. If a champion's health is above the maximum health ($h > H$), then it is adjusted to its maximum health. H will always be a positive integer.

In a teamfight, the health of the champion may increase or decrease. More specifically, during a teamfight, the champion was subject to n actions. The i-th ($1 \le i \le n$) action increases the health of the champion by a_i, subject to the rules above. If a_i is positive, it means the champion was healed. If a_i is negative, it means the champion was attacked. If a_i is zero, then nothing happened to the champion.

Wookje's favorite champion in League of Legends is a lamb named *Kindred*. Kindred has a ultimate ability named *Lamb's Respite*. Let's see what this ability does.



Formally, consider a champion with maximum health H. If Wookje activates *Lamb's Respite* from right before the l-th action until right after the r-th action, a champion's health will never fall below $\lceil \frac{H}{10} \rceil$ during these actions. If a champion's health was less than or equal to $\lceil \frac{H}{10} \rceil$ right before the l-th action, or would hypothetically be less than or equal to $\lceil \frac{H}{10} \rceil$ after the i-th action for some $l \le i \le r$, then its health is set to $\lceil \frac{H}{10} \rceil$ and does not change any further until after the r-th action completes. Otherwise, *Lamb's Respite* does not affect how the champion's health changes.

It is very important to make the right decision on when to activate *Lamb's Respite*. Wookje wants to improve his decision-making skills. However, the teamfights are too complicated, therefore it's hard for him to know when to activate *Lamb's Respite*. To help him, please process the following q queries:

- `1 l r x`: The champion's maximum health is x, and its health starts at x. *Lamb's Respite* is active from right before the l-th action to right after the r-th action. Output the health of the champion after the n actions. If the champion dies, output 0. ($1 \le l \le r \le n, 1 \le x \le 10^9$).
- `2 i x`: Update a_i to x. ($1 \le i \le n, -10^9 \le x \le 10^9$).

Input

The first line contains two integers, n and q ($1 \le n, q \le 300\,000$).

The second line contains n integers. The i-th integer is a_i ($|a_i| \le 10^9$).

The next q lines contain several integers denoting the queries in the described form.

There is at least 1 query of type 1.

Output

For each query of type 1, output a single integer denoting the answer to that query. Each answer should go on its own line.

Examples

standard input	standard output
4 10 0 1 1 -1 1 2 4 2 2 2 -1 1 2 4 2 1 2 3 2 2 1 -1 1 1 4 2 1 2 4 2 2 1 -2 1 1 4 2 1 2 4 2	1 1 0 1 1 1 0
6 6 2 5 -3 8 1 -4 1 2 5 7 1 1 3 2 2 2 -1 1 4 6 2 2 1 -1 1 1 6 6	3 0 0 1

Problem H. Or Machine

Input file:	standard input
Output file:	standard output
Time limit:	4 seconds
Memory limit:	1024 megabytes

We are developing the Or Machine, a computer heavily optimized solely for one kind of operation: the `|=` operator in C++'s term.

The Or Machine has n registers, each containing a nonnegative integer less than 2^8. We label them $x_1, x_2, \cdots, x_n$. A program is represented by a list of l operations. Each operation is represented by a pair of integers (a, b), meaning that the machine should update x_a with the bitwise OR of x_a's and x_b's values.

The Or Machine takes a program, the initial values of the registers, and a positive integer t. When run, the program performs each operation in the program one by one. When the last operation is performed, it goes back to the first operation and repeats the process. The machine stops after performing exactly t operations.

We want our machine to be much faster than general-purpose computers, and hardware optimization is probably not enough. Can you help us with some software optimization?

Input

The first line contains three integers, n, l, and t ($1 \le n, l \le 2^{18}$, $1 \le t \le 10^{18}$). l is the length of the program.

The program is given on the next l lines. Each line contains two integers a and b ($1 \le a, b \le n$) representing the pair of registers that participate in the given operation.

The final line contains n integers, the initial values of the registers $x_1, \cdots, x_n$ ($0 \le x_i < 2^8$).

Output

Output n integers on a single line, the values of the registers $x_1, \cdots, x_n$ after t operations.

Example

standard input	standard output
5 4 5 1 2 2 3 2 4 4 4 8 0 5 3 10	15 7 5 3 10

Problem I. Organizing Colored Sheets

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	1024 megabytes

There is a large grid of size $n \times m$, where each grid cell is either colored or uncolored.

To make some artwork on the grid, Hyunuk wants to put some sheets of colored paper in some of the uncolored cells. Hyunuk selects two integers w, h where $1 \le w \le m, 1 \le h \le n$. Then, Hyunuk covers the grid with sheets of colored paper of width w and height h, satisfying the following conditions.

- The colored paper should exactly cover the grid cells, and not go out of the grid.
- The colored paper cannot be rotated.
- A cell may be covered with more than one sheet of colored paper.
- Every uncolored cell must be covered with at least one sheet of colored paper.
- No colored cell can be covered with any colored paper.

Depending on the selection of width and height, Hyunuk may fail to cover the grid satisfying the above conditions. Please compute the number of possible sheet sizes that can cover the grid satisfying all the above conditions.

Input

The first line contains two integers n and m $(1 \le n, m \le 3\,000)$.

The next n lines each contain a length m string denoting the state of the grid. `.` denotes an uncolored cell, and `#` denotes a colored cell.

There is at least one uncolored cell in the grid.

Output

Output the number of possible sheet sizes that can cover the grid satisfying all the above conditions.

Examples

standard input	standard output
3 3 ..# ... #..	4
8 9 ....#..... .....#... ....#....	4
9 9 ######... ######... ######... #........ #.....### #.....### #####.... #####.... #####....	9
5 5 ....# ...## ..### .####	1

Note

In the first example, the following four colored paper satisfy the conditions: 1×1, 1×2, 2×1, and 2×2. Since the colored paper can not be rotated, 1×2 and 2×1 are considered different sizes.

Problem J. Periodic Ruler

Input file:	standard input
Output file:	standard output
Time limit:	2 seconds
Memory limit:	1024 megabytes

Hitagi has a ruler of infinite length. It has a mark on every integer, where the mark on integer i has color c_i. Each color is represented by an integer from 1 to 100.

She noticed that the ruler's color pattern repeats with a period of t. The period t is defined by the **smallest** positive integer that satisfies $c_i = c_{i+t}$ for all integers i.

Hitagi told Koyomi the colors of n marks of her choice. Koyomi wants to find all positive integers that **cannot** be a period of the ruler, regardless of the colors of unchosen marks. Write a program to find all such numbers, and output their count and sum.

Input

The first line contains a single integer n ($1 \le n \le 50$).

The following n lines each contain two integers x_i ($|x_i| \le 10^9$) and a_i ($1 \le a_i \le 100$). This indicates that the integer x_i is marked with the color a_i.

If $i \ne j$, then $x_i \ne x_j$.

Output

Output two integers on one line. The first integer is the number of positive integers that cannot be the period of the ruler. The second integer is their sum.

Examples

standard input	standard output
3 -1 1 1 2 2 1	2 3
5 1 1 2 1 3 1 4 1 5 1	4 14
1 1000000000 100	0 0

Problem K. Three Competitions

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	1024 megabytes

Last month, n people participated in three competitions. The people are labeled with distinct integers from 1 to n. In each competition, the people were sorted by performance and got ranked from 1 to n. The lower the rank, the better the player. There were no ties in any of the rankings.

Today, instead of n people participating at once, two people compete head-to-head. The winner of the match is the person who wins at least two out of three competitions. The winner then proceeds to compete with another person. This turned out to be quite interesting: even if a person a cannot directly win against another person b, it's possible that another person c wins against b and then a wins against c. That way, we can say that a "indirectly" wins against b. It's also possible that two people can indirectly win against each other!

Formally, a person a is said to **directly win against** another person b if a has a lower rank than b in at least two competitions. Also, a is said to **indirectly win against** b if there exists a sequence of people $p_1, p_2, \cdots, p_k$ ($k \geq 2$) such that p_i directly wins against p_{i+1} for all $i = 1, \cdots, k-1$, $p_1 = a$ and $p_k = b$.

Given the ranks of the people in each competition, answer q questions asking whether person a indirectly wins against another person b.

Input

The first line contains a single integer n ($2 \leq n \leq 2 \cdot 10^5$), the number of people.

Each of the next n lines contains three integers, which represent the ranks of each person in each of the three competitions, in order from person 1 to person n. For each competition, each integer rank from 1 to n appears exactly once.

The next line contains a single integer q ($1 \leq q \leq 2 \cdot 10^5$), the number of questions.

Each of the next q lines contains two integers a and b ($1 \leq a, b \leq n$, $a \neq b$), asking whether person a indirectly wins against person b.

Output

Output Q lines. The i-th line should be either `YES` or `NO`. If person a indirectly wins against person b, output `YES`, otherwise output `NO`.

Example

standard input	standard output
4 2 4 3 3 1 4 4 3 2 1 2 1 3 1 2 2 1 3 4	YES YES NO

Note

Person 1 directly (and indirectly) wins against 2. Person 2 doesn't directly win against 1, but 2 directly wins against 3 and 3 directly wins against 1, so 2 indirectly wins against 1.

Problem L. Utilitarianism 2

Input file:	standard input
Output file:	standard output
Time limit:	7 seconds
Memory limit:	1024 megabytes

To fight the COVID-19 pandemic, vaccines must be transported efficiently to the people. There are n vaccine manufacturers (numbered from 1 to n), m hospitals (numbered from 1 to m), and k agents (numbered from 1 to k) in RUN-land. Agents deliver vaccines from manufacturers to hospitals. The i-th agent has an assignment to deliver c_i vaccines from manufacturer a_i to hospital b_i. The assignments are designed such that for any two agents, they must be assigned to different manufacturers or different hospitals, or both.

RUN-land has a very important law: no manufacturer can use more than one agent, and no hospital can receive vaccines from more than one agent. It is possible that not all agents will be called on to complete their assignments.

The agents play an important role in this battle with the pandemic. Therefore, they should be rewarded reasonably based on their merits. The principle known as *Vickery-Clarke-Groves pricing* states the social value of each agent as follows. Given a set of participating agents S, let $f(S)$ be the maximum possible count of vaccines delivered to hospitals, subject to the law stated above. Let U be the set of all agents. Then the social value of each agent e is $f(U) - f(U \setminus \{e\})$.

In short, given that the agents always act to maximize the number of vaccines that are delivered, the social value of the agent corresponds to the decrease in the number of vaccines delivered if that agent does not participate.

Please determine the social value for all agents.

Input

The first line contains three integers n, m, and k ($1 \le n, m \le 2\,000$, $1 \le k \le \min(8\,000, n \times m)$).

The next k lines contains three integers a_i, b_i, and c_i ($1 \le a_i \le n$, $1 \le b_i \le m$, $1 \le c_i \le 10^{12}$).

If $i \ne j$, $(a_i, b_i) \ne (a_j, b_j)$.

Output

Output k lines, where the i-th line contains a single integer denoting the social value of agent i.

Example

standard input	standard output
5 5 7 1 4 3 5 1 7 2 2 8 3 5 2 4 3 8 2 3 6 5 4 9	1 1 8 2 8 0 0

Problem M. Yet Another Range Query Problem

Input file:	standard input
Output file:	standard output
Time limit:	3 seconds
Memory limit:	1024 megabytes

You are given an array A, consisting of distinct integers in the range $1, 2, \ldots, n$.

Let B be an $n \times n$ matrix, where $B_{i,j} = \min(A_i, \ldots, A_j) \times \max(A_i, \ldots, A_j)$ if $i \le j$. Otherwise, $B_{i,j} = 0$.

Given q queries of the form l, r, s, e, please compute the value $\sum_{x=l}^{r} \sum_{y=s}^{e} B_{x,y}$ modulo $10^9 + 7$.

Input

The first line contains two integers n and q ($1 \le n, q \le 150\,000$).

The next line contains n distinct integers $A_1, A_2, \ldots, A_n$ ($1 \le A_i \le n$).

The next q lines each contain four integers l, r, s, e, the i-th such line denoting the parameters of the i-th query. ($1 \le l \le r \le n, 1 \le s \le e \le n$).

Output

Output q lines. On the i-th line, output the answer of the i-th query.

Example

standard input	standard output
10 10 7 6 1 10 5 3 2 4 8 9 1 2 7 8 7 9 8 8 2 10 8 8 5 10 1 4 7 9 2 9 1 7 8 10 3 8 5 9 3 10 2 6 1 4 4 8 1 3 1 5	40 24 82 0 140 278 381 260 370 201