Problem A. Where is the legend?

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Given an array a of n positive integers. In one operation, you can remove a number from the array a, if it is equal to the arithmetic mean of its neighbors. However, you can not remove the first and last numbers of the array. Formally, you can remove the number a_i, if $a_i = \frac{a_{i-1}+a_{i+1}}{2}$. For example, if you remove 6 from an array $[1, 3, 6, 9, 4]$, the resulting array would be $[1, 3, 9, 4]$.

What is the shortest possible length of the array you could get using the operation described above some number of times(maybe, zero)?

Input

The first line contains one integer t ($1 \le t \le 10^3$) — the number of test cases.

The next $2 \cdot t$ lines are in the following pattern:

First line of each test case contains one number n ($3 \le n \le 3 \cdot 10^5$) — the length of an array a.

The second line of each test case contains n numbers $a_1, \ldots, a_n$ ($1 \le a_i \le 10^9$, for each i, where $1 \le i \le n$).

It is guaranteed, that the sum of n across all test cases does not exceed $3 \cdot 10^5$.

Output

For each test case print one number — the shortest possible length of the array a, that you could get by using described operation.

Scoring

Let S be the sum of n over all test cases.

Subtask	Additional constraints	Score	Necessary subtasks
0	Examples	0	—
1	$n \le 15$, $S \le 400$	14	0
2	$a_i = i$	13	—
3	$a_i \le 3$	9	—
4	$n \le 300, S \le 1000$	17	1
5	$n \le 3000, S \le 10000$	18	4
6	—	29	2, 3, 5

Example

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

Note

For example, in the array $[1, 2, 4]$, there are no possible operations, since $\frac{1+4}{2} = 2.5 \neq 2$.

Problem B. Zhylan.io

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	512 megabytes

"Zhylan.io" is an online multiplayer game where players control snakes. Suppose m players are competing in a match. Let's assign each player a number from 1 to m. The i-th player controls a snake with length b_i. The i-th player's snake can attack the j-th ($i \neq j$) player's snake only if the condition $b_i - b_j \geq k$ is met. In which case, player j leaves the match while the length of i-th player's snake increases by b_j. The number k is chosen before the start of a match, and could differ from match to match.

A match continues until there are no possible attacks left. If, at the end of a match, only one player remains, he becomes a winner of that match. Otherwise, the match ends in a draw and with no winners.

Vitya is a huge fan of "Zhylan.io" with tons of experience. He claims, that for any match, he is able to correctly predict the number of players that could win that match.

Batyr decided to check Vitya's abilities. So, he wrote down an array of positive integers a of length n.

Then, Batyr asks Vitya q questions of the following type.

- If a match between players with snakes $(a_l, \ldots, a_r)$ and a parameter k was to start, how many of these players could possibly win?

Actually, Vitya lied and now asks for your help to answer Batyr's questions. Help him.

Input

The first line contains two numbers n and q ($2 \leq n \leq 2 \cdot 10^5$, $1 \leq q \leq 2 \cdot 10^5$) — the size of an array a and the number of Batyr's questions.

Second line contains n integers $a_1, \ldots, a_n$ ($1 \leq a_i \leq 10^9$).

Then, q lines follow. Each line contains three integers l_i, r_i and k_i ($1 \leq l_i < r_i \leq n$, $0 \leq k_i \leq 10^9$) — descriptions of questions.

Output

For each of Batyr's questions print a single integer in separate line — answer to Batyr's question.

Scoring

Subtask	Additional constraints	Points	Necessary subtasks
0	Samples	0	—
1	$n, q \leq 500$	7	0
2	$n, q \leq 3000$	15	1
3	$a_1 \leq a_2 \leq \ldots \leq a_n$	24	—
4	$n, q \leq 5 \cdot 10^4, a_i \leq 10^6$	20	0
5	$n, q \leq 10^5$	19	2, 4
6	—	15	3, 5

Examples

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

Problem C. Mansur vs Tima

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Tima came back from his journey to Xorland and brought back an array of n integers. Xorland is a small country known for its food, music, and games on arrays. A peculiarity of Xorland's games is that there is no winner: friendship always wins! One of such games is "Xor-Mat".

Rules of "Xor-Mat" are simple. Two players, before the start of the game, choose an array a and an integer k. Then, the first player paints each number in the array with one of the k colors. Let c_i be the color of i-th number in the array if we order the colors from 1 to k. Second player, then, chooses a pair of indices (i, j) such that $i \neq j$ and $c_i = c_j$.

The goal of the first player is to maximize $a_i \oplus a_j$, while, second player tries to minimize $a_i \oplus a_j$. Here, $\oplus$ is a bitwise "XOR" operation.

Mansur challenged Tima for a "Xor-Mat" game. They are playing on Tima's array. Mansur goes first and Tima is second. Print the value of $a_i \oplus a_j$ when both players play optimally. Also, find out an optimal coloring of the array that Mansur might choose.

Input

The first line contains one integer t ($1 \leq t \leq 5 \cdot 10^4$) — the number of test cases.

The $2 \cdot t$ lines follow in following pattern:

The first line of each test case contains two integers $n (2 \leq n \leq 5 \cdot 10^4)$ and $k (1 \leq k \leq min(n-1, 50))$.

Second line of each test case contains n integers $a_1, a_2, \ldots, a_n (1 \leq a_i \leq 10^9)$ — Tima's array.

It is guaranteed, that the sum of n across all test cases does not exceed $5 \cdot 10^4$.

Output

For each test case in input print two lines:

- In the first line, print the value of $a_i \oplus a_j$ when both players play optimally.
- In the second line, print n integers $c_1, c_2, \ldots, c_n (1 \leq c_i \leq k)$, where c_i is equal to the color that Mansur chooses for i-th number of the array. If there are more than one possible ways to color the array optimally, print any of them.

Scoring

Let S be the sum of n over all test cases.

Subtask	Additional constraints	Points	Necessary subtasks
0	Example	0	—
1	$S \leq 10, k \leq 5$	6	0
2	$S \leq 50000, k = 1$	10	
3	$S \leq 1000, k \leq 2$	10	—
4	$S \leq 50000, k \leq 2$	20	2, 3
5	$S \leq 50000, k \leq 4$	22	1, 4
6	—	32	5

Example

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