To the moon

Background

To The Moon is a independent game released in November 2011, it is a role-playing adventure game powered by RPG Maker.

The premise of *To The Moon* is based around a technology that allows us to permanently reconstruct the memory on dying man. In this problem, we'll give you a chance, to implement the logic behind the scene.

Description

You‘ve been given N integers A[1], A[2],..., A[N]. On these integers, you need to implement the following operations:

- C l r d: Adding a constant d for every {Ai | l <= i <= r}, and increase the timestamp by 1, this is the only operation that will cause the timestamp increase.
- Q l r: Querying the current sum of {Ai | l <= i <= r}.
- H l r t: Querying a history sum of {Ai | l <= i <= r} in time t.
- B t: Back to time t. And once you decide return to a past, you can never be access to a forward edition anymore.

.. N, M ≤ 10^5, |A[i]| ≤ 10^9, 1 ≤ l ≤ r ≤ N, |d| ≤ 10^4 .. the system start from time 0, and the first

modification is in time 1, $t \geq 0$, and won't introduce you to a future state.

Input

n m
A1 A2 ... An
... (here following the m operations.)

Output

... (for each query, simply print the result.)

Example

Input 1:
10 5
1 2 3 4 5 6 7 8 9 10
Q 4 4
Q 1 10
Q 2 4
C 3 6 3
Q 2 4

Output 1:
4
55
9
15

Input 2:
2 4
0 0
C 1 1 1
C 2 2 -1
Q 1 2
H 1 2 1

Output 2:
0
1