9 The Impossible Train

At the Tallahassee rail yard, the night crew keeps rearranging a train just as its inspection robot is about to get to work. The train has N carriages with permanent IDs $1, 2, \ldots, N$, initially arranged in that order from front to back. Carriage i has an energy change w_i: a positive value charges the robot, a negative value consumes energy, and zero leaves its energy unchanged. The crew can reverse sections, move sections, and change a carriage's energy value.

For each inspection, the robot must pass through every carriage in a requested section, from front to back. It starts immediately before the first carriage with a fully charged battery of nonnegative integer capacity C. Upon entering carriage i with energy E, its energy becomes $\min(C, E + w_i)$; excess charge is lost, and the inspection fails if its energy becomes negative. Exactly zero energy is allowed. The robot may use an emergency charger **at most once**, after successfully processing one carriage and before entering the next carriage within the inspected section. This restores its energy to C. Recharging during a carriage's energy change is not allowed, and moving between carriages costs no energy. Your task is to find the **smallest battery capacity** that allows each requested inspection to finish.

9.1 Input

The first line contains two integers N and Q, the number of carriages and the number of commands.
The second line contains N integers $w_1, w_2, \ldots, w_N$, where w_i is the initial energy change of carriage i.
Each of the next Q lines contains one of the following commands:

- `REVERSE a b`: Reverse the consecutive section from carriage `a` through carriage `b`, including both endpoints. Each carriage keeps its ID and energy value.
- `MOVE a b c`: Remove the consecutive section from carriage `a` through carriage `b` and insert it immediately after carriage `c` in the remaining train, preserving the section's current order. If `c` is `0`, insert the section at the front of the train.
- `SET a x`: Replace the energy change of carriage `a` with `x`.
- `QUERY a b`: Report the minimum battery capacity needed to inspect the consecutive section from carriage `a` through carriage `b`, including both endpoints.

All carriage references are **permanent IDs, not current positions**. In every `REVERSE`, `MOVE`, and `QUERY` command, carriage `a` is guaranteed to appear no later than carriage `b` in the current train; they may be the same carriage. For a `MOVE` command with nonzero `c`, carriage `c` is guaranteed to lie outside the moved section.
Commands take effect in the order given. Every query is an independent inspection with a new full battery and its own optional emergency recharge. Queries do not change the train or its energy values.

9.2 Output

For each `QUERY` command, print one integer: the minimum battery capacity C. Print each answer on its own line. A capacity of zero is allowed. Answers may exceed the range of a 32-bit signed integer.

9.3 Constraints

$$1 \leq N, Q \leq 200\,000$$
$$-10^9 \leq w_i, x \leq 10^9$$
$$1 \leq a, b \leq N$$
$$0 \leq c \leq N$$

- item There is at least one `QUERY` command.
- All input values are integers.

9.4 Sample Input/Output

Sample Input 1	**Sample Output 1**
3 1 10 -6 -6 QUERY 1 3	6

Sample Input 2	**Sample Output 2**
5 10 -8 12 -3 -6 4 QUERY 1 5 REVERSE 2 4 QUERY 1 5 MOVE 4 3 5 QUERY 1 3 SET 1 0 QUERY 1 3 MOVE 4 3 0 QUERY 4 5 QUERY 2 2	8 9 8 6 6 0