Problem H. Dynamic Convex Hull

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	512 mebibytes

Let's first see a related classical algorithm to help you solve this problem: You will be given n functions $f_1(x), f_2(x), \ldots, f_n(x)$, where $f_i(x) = a_i x + b_i$. When you want to find the minimum value of $f_i(x)$ over all i for a fixed parameter x, you just need to find the corresponding function on the convex hull.

Now you will be given n functions $f_1(x), f_2(x), \ldots, f_n(x)$, where $f_i(x) = (x - a_i)^4 + b_i$.

You need to perform m operations. Each operation has one of the following forms:

- "`1 a b`" ($1 \le a \le 50\,000$, $1 \le b \le 10^{18}$): Add a new function $f_{n+1}(x) = (x-a)^4 + b$ and then change n into $n+1$.
- "`2 t`" ($1 \le t \le n$): Delete the function $f_t(x)$. It is guaranteed that each function won't be deleted more than once.
- "`3 x`" ($1 \le x \le 50\,000$): Query for the minimum value of $f_i(x)$, where $1 \le i \le n$ and the function $f_i(x)$ has not been deleted yet.

Input

The first line contains a single integer T ($1 \le T \le 5$), the number of test cases. For each test case:

The first line contains two integers n and m ($1 \le n, m \le 100\,000$) denoting the number of functions and the number of operations.

Each of the following n lines contains two integers a_i and b_i ($1 \le a_i \le 50\,000$, $1 \le b_i \le 10^{18}$), denoting the i-th function $f_i(x)$.

Each of the next m lines describes an operation in the format shown above.

Output

For each query, print a single line containing an integer denoting the minimum value of $f_i(x)$. When there are no functions, print "`-1`" instead.

Example

standard input	standard output
1 2 8 3 9 6 100 3 4 2 1 3 4 1 1 1 3 4 2 2 2 3 3 4	10 116 82 -1