

Problem A. Advertisement Matching

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

MOLOCO is a company that matches advertisers with potential users using their high-performance ad platform. MOLOCO is in contact with N advertisers, where the i -th advertiser has paid for a_i advertisements to deliver. Our advanced prediction algorithm has picked M potential recipients, which we will deliver the advertisements to. For the j -th audience, we can deliver up to b_j advertisements.

Jaehyun is testing several hypotheses to increase engagement in the advertisements. One day, Jaehyun thought that all advertisements received by a single recipient should come from different advertisers: it is boring to watch the same advertisement multiple times.

Jaehyun wants to estimate the profitability of his hypotheses. He will perform the following kinds of updates.

- 1 i : Increase a_i by one.
- 2 i : Decrease a_i by one.
- 3 j : Increase b_j by one.
- 4 j : Decrease b_j by one.

All updates are cumulative. Jaehyun wants to check if the system can deliver all advertisements of our advertisers given the changing landscape of the advertisers and recipients.

Input

The first line contains two integers, N and M ($1 \leq N, M \leq 250\,000$).

The next line contains N integers $a_1, a_2, \dots, a_N$ ($0 \leq a_i \leq 250\,000$).

The next line contains M integers $b_1, b_2, \dots, b_M$ ($0 \leq b_j \leq 250\,000$).

The next line contains a single integer Q ($1 \leq Q \leq 250\,000$).

The next Q lines contain two integers in one of the following forms:

- 1 i ($1 \leq i \leq N$)
- 2 i ($1 \leq i \leq N$)
- 3 j ($1 \leq j \leq M$)
- 4 j ($1 \leq j \leq M$)

The input will be set in a way such that all a_i and b_j values are always nonnegative.

Output

Print Q lines. On the i -th line, print 1 if all advertisements can be delivered given the first i updates, and 0 otherwise.

Example

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