CODEFORCES
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B2. The Strict Teacher (Hard Version)

time limit per test: 1.5 seconds

memory limit per test: 256 megabytes

This is the hard version of the problem. The only differences between the two versions are the constraints on m and q. In this version, $m, q \leq 10^5$. You can make hacks only if both versions of the problem are solved.

Narek and Tsovak were busy preparing this round, so they have not managed to do their homework and decided to steal David's homework. Their strict teacher noticed that David has no homework and now wants to punish him. She hires other teachers to help her catch David. And now m teachers together are chasing him. Luckily, the classroom is big, so David has many places to hide.

The classroom can be represented as a one-dimensional line with cells from 1 to n, inclusive.

At the start, all m teachers and David are in **distinct** cells. Then they make moves. During each move

- David goes to an adjacent cell or stays at the current one.
- Then, each of the m teachers simultaneously goes to an adjacent cell or stays at the current one.

This continues until David is caught. David is caught if any of the teachers (possibly more than one) is located in the same cell as David. **Everyone sees others' moves, so they all act optimally.**

Your task is to find how many moves it will take for the teachers to catch David if they all act optimally.

Acting optimally means the student makes his moves in a way that maximizes the number of moves the teachers need to catch him; and the teachers coordinate with each other to make their moves in a way that minimizes the number of moves they need to catch the student.

Also, as Narek and Tsovak think this task is easy, they decided to give you q queries on David's position.

Input

In the first line of the input, you are given a single integer t ($1 \leq t \leq 10^5$) — the number of test cases. The description of each test case follows.

In the first line of each test case, you are given three integers n, m, and q ($3 \leq n \leq 10^9, 1 \leq m, q \leq 10^5$) — the number of cells on the line, the number of teachers, and the number of queries.

In the second line of each test case, you are given m distinct integers $b_1, b_2, \ldots, b_m$ ($1 \leq b_i \leq n$) — the cell numbers of the teachers.

In the third line of each test case, you are given q integers $a_1, a_2, \ldots, a_q$ ($1 \leq a_i \leq n$) — David's cell number for every query.

It is guaranteed that for any i, j such that $1 \leq i \leq m$ and $1 \leq j \leq q$, $b_i \neq a_j$.

It is guaranteed that the sum of values of m over all test cases does not exceed $2 \cdot 10^5$.

It is guaranteed that the sum of values of q over all test cases does not exceed $2 \cdot 10^5$.

Output

For each test case, output q lines, the i-th of them containing the answer of the i-th query.

Example

```
input                                    Copy
2
8 1 1
6
3
10 3 3
1 4 8
2 3 10
```

```
output                                   Copy
5
1
1
2
```

Note

In the only query of the first example, the student can run to cell 1. It will take the teacher five moves to reach from cell 6 to cell 1, so the answer is 5.

In the second query of the second example, the student can just stay at cell 3. The teacher, initially located in cell 4, can reach cell 3 in one move. Therefore, the answer is 1.

→ Last submissions

Submission	Time	Verdict
281293777	Sep/15/2024 04:54	Accepted
281293241	Sep/15/2024 04:45	Wrong answer on test 2
281293139	Sep/15/2024 04:43	Wrong answer on test 2
281293075	Sep/15/2024 04:42	Wrong answer on test 2
281290676	Sep/15/2024 03:48	Wrong answer on test 2
281289372	Sep/15/2024 03:14	Wrong answer on test 2
281289326	Sep/15/2024 03:12	Wrong answer on test 2

→ Problem tags

binary search   greedy   math   sortings
*1200

No tag edit access

→ Contest materials

- Announcement (en)   ✕
- Tutorial #1 (en)   ✕
- Tutorial #2 (en)   ✕
- Video Editorial (en)   ✕