CODEFORCES
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PROBLEMS   SUBMIT CODE   MY SUBMISSIONS   STATUS   HACKS   ROOM   STANDINGS   CUSTOM INVOCATION

D. Persistent Bookcase

time limit per test: 2 seconds

memory limit per test: 512 megabytes

Recently in school Alina has learned what are the *persistent data structures*: they are data structures that always preserves the previous version of itself and access to it when it is modified.

After reaching home Alina decided to invent her own persistent data structure. Inventing didn't take long: there is a bookcase right behind her bed. Alina thinks that the bookcase is a good choice for a persistent data structure. Initially the bookcase is empty, thus there is no book at any position at any shelf.

The bookcase consists of n shelves, and each shelf has exactly m positions for books at it. Alina enumerates shelves by integers from 1 to n and positions at shelves — from 1 to m. Initially the bookcase is empty, thus there is no book at any position at any shelf in it.

Alina wrote down q operations, which will be consecutively applied to the bookcase. Each of the operations has one of four types:

- $1\ i\ j$ — Place a book at position j at shelf i if there is no book at it.
- $2\ i\ j$ — Remove the book from position j at shelf i if there is a book at it.
- $3\ i$ — Invert book placing at shelf i. This means that from every position at shelf i which has a book at it, the book should be removed, and at every position at shelf i which has not book at it, a book should be placed.
- $4\ k$ — Return the books in the bookcase in a state they were after applying k-th operation. In particular, $k = 0$ means that the bookcase should be in initial state, thus every book in the bookcase should be removed from its position.

After applying each of operation Alina is interested in the number of books in the bookcase. Alina got 'A' in the school and had no problem finding this values. Will you do so?

Input

The first line of the input contains three integers n, m and q ($1 \le n, m \le 10^3$, $1 \le q \le 10^5$) — the bookcase dimensions and the number of operations respectively.

The next q lines describes operations in chronological order — i-th of them describes i-th operation in one of the four formats described in the statement.

It is guaranteed that shelf indices and position indices are correct, and in each of fourth-type operation the number k corresponds to some operation before it or equals to 0.

Output

For each operation, print the number of books in the bookcase after applying it in a separate line. The answers should be printed in chronological order.
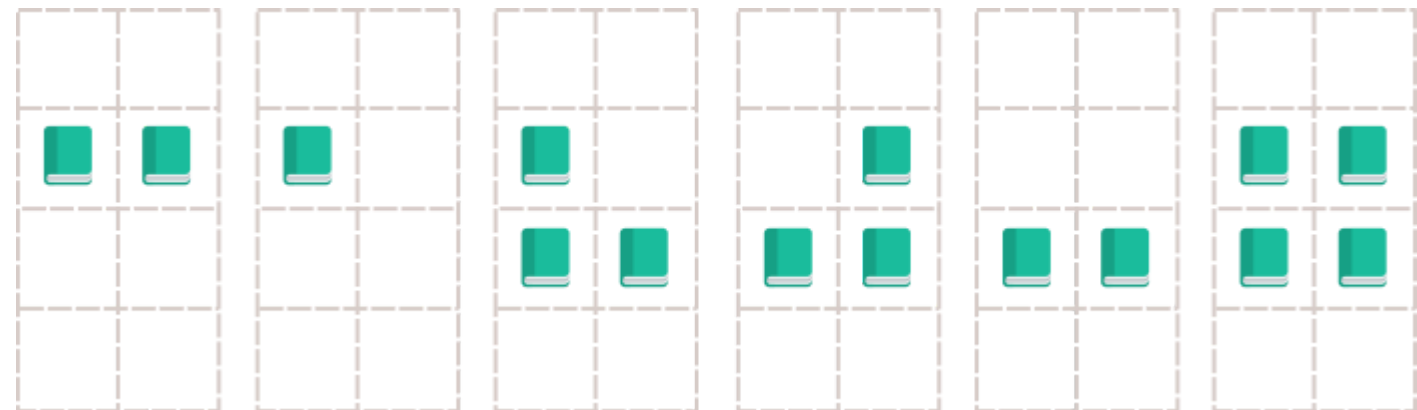
Examples

input	Copy

```
2 3 3
1 1 1
3 2
4 0
```

output	Copy

```
1
4
0
```

input	Copy

```
4 2 6
3 2
2 2 2
3 3
3 2
2 2 2
3 2
```

output	Copy

```
2
1
3
3
2
4
```

input	Copy

```
2 2 2
3 2
2 2 1
```

output	Copy

```
2
1
```

Note

This image illustrates the second sample case.

→ Virtual participation ∨

Virtual contest is a way to take part in past contest, as close as possible to participation on time. It is supported only ICPC mode for virtual contests. If you've seen these problems, a virtual contest is not for you - solve these problems in the archive. If you just want to solve some problem in a contest, a virtual contest is not for you - solve this problem in the archive. Never use someone else's code, read the tutorials or communicate with other person during a virtual contest.

[Start virtual contest]

→ Clone Contest to Mashup ∨

You can clone this contest to a mashup.

[Clone Contest]

→ Submit?

Language: [GNU G++20 13.2 (64 bit, win ▾]

Choose file: [Choose File] No file chosen

[Submit]

→ Last submissions

Submission	Time	Verdict
286674471	Oct/19/2024 12:11	Accepted
286670303	Oct/19/2024 11:43	Accepted
286669735	Oct/19/2024 11:39	Wrong answer on test 21
286668616	Oct/19/2024 11:31	Memory limit exceeded on test 47
286668118	Oct/19/2024 11:28	Memory limit exceeded on test 47
286666134	Oct/19/2024 11:15	Memory limit exceeded on test 47
286218709	Oct/16/2024 15:01	Wrong answer on test 1
285441572	Oct/12/2024 13:16	Accepted

→ Problem tags

bitmasks   data structures

dfs and similar   implementation   *2200

No tag edit access

→ Contest materials

- Announcement (en) ✖
- Tutorial ✖