L: Magic Cube

Time Limit: 2 seconds, Memory limit: 2G

Imagine you are holding an $n \times n \times n$ cube, which is split up into n^3 smaller cubes labeled from 1 to n^3. The orientation of the axes is left-to-right for the x-axis, back-to-front for the y-axis, and bottom-to-top for the z-axis. For example, a $2 \times 2 \times 2$ cube is labeled as such:

Bottom layer ($z = 1$):

```
1 2
3 4
```

Top layer ($z = 2$):

```
5 6
7 8
```

In the context of a $2 \times 2 \times 2$ cube:

- Cube 1 is at (1, 1, 1).
- Cube 2 is at (2, 1, 1).
- Cube 3 is at (1, 2, 1).
- Cube 5 is at (1, 1, 2).

Each time you rotate the cube at slice k along one of the x-, y-, and z- axes, you are rotating the $(k + 1)$th layer along the corresponding axis, as well as all the layers after k in the increasing direction of that axis.

Input

The first line contains two integers, n ($2 \leq n \leq 1\,000$) and m ($1 \leq m \leq 2\,000$), the size of the cube and the number of operations.

Each of the next m lines contains the information regarding an operation, and will be one of the following:

- x, θ, k: Rotate slices $k + 1$ through slice n by θ degrees counterclockwise around the x-axis.

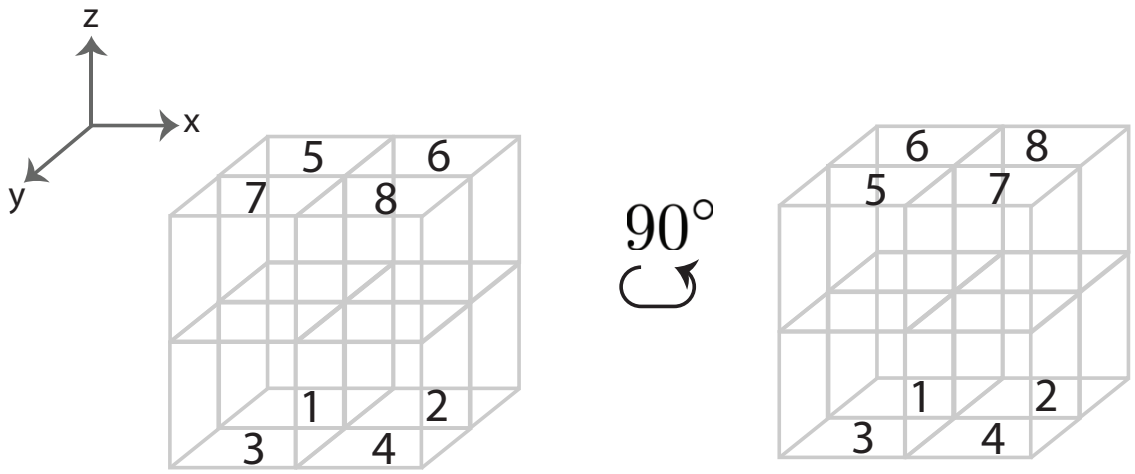


Figure 1: A $2 \times 2 \times 2$ cube after rotating at slice $z = 1$.

- `y`, θ, k: Rotate slices $k+1$ through slice n by θ degrees counterclockwise around the y-axis.
- `z`, θ, k: Rotate slices $k+1$ through slice n by θ degrees counterclockwise around the z-axis.
- `q x y z`: This is a query operation. Output which cube is at location (x, y, z).

For the first three operations, it is guaranteed that $0 \leq k \leq n-1$ and $\theta \in \{90, 180, 270, 360\}$. For queries, (x, y, z) denotes the query location and $1 \leq x, y, z \leq n$. It is guaranteed there will be at least one query. The cube does not reset between operations. That is, rotations are cumulative.

Output

For each query operation, output which cube is at the given location.

Sample Input 1	Sample Output 1
2 8 x 360 1 y 360 1 q 1 1 2 z 90 1 x 360 1 q 1 2 1 q 2 1 1 q 2 2 2	5 3 2 7

Sample Input 2

```
2 7
x 180 1
q 1 1 1
q 1 1 2
y 270 1
q 2 1 1
q 2 1 2
q 2 2 1
```

Sample Output 2

```
1
5
8
4
2
```

Sample Input 3

```
3 7
y 270 1
q 1 1 1
q 1 2 3
z 360 2
q 3 2 1
q 2 2 2
q 3 3 3
```

Sample Output 3

```
1
4
24
14
25
```

This page is intentionally left blank.