

## ACM-ICPC Indonesia National Contest 2016

## Problem K

## Operations on Matrix

Time Limit: 1 second

In this problem, you are given a matrix  $A$  of  $N \times M$  (i.e.  $A[1 \dots N][1 \dots M]$ ) and  $Q$  queries where each query is one of the following:

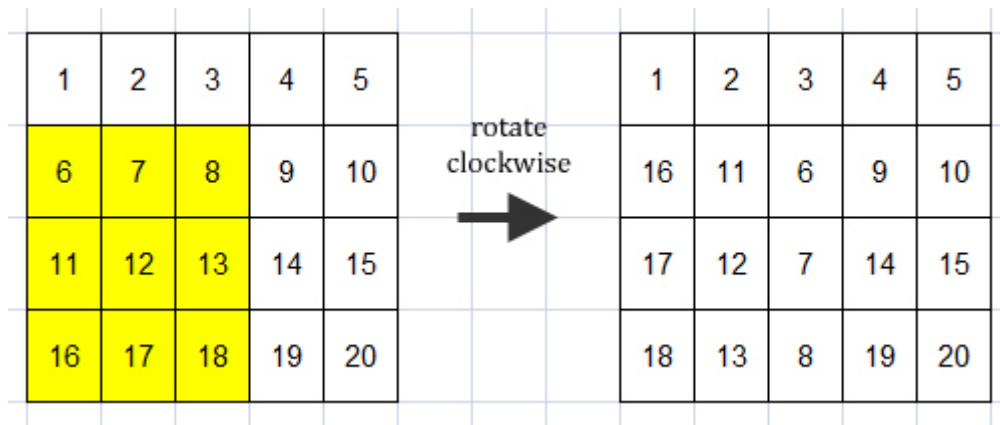
- `rotate cw r c s`  
Rotate the square submatrix  $A[r \dots r+s][c \dots c+s]$  clockwise.
- `rotate ccw r c s`  
Rotate the square submatrix  $A[r \dots r+s][c \dots c+s]$  counterclockwise.
- `reflect x r1 c1 r2 c2`  
Reflect the submatrix  $A[r_1 \dots r_2][c_1 \dots c_2]$  on x-axis.
- `reflect y r1 c1 r2 c2`  
Reflect the submatrix  $A[r_1 \dots r_2][c_1 \dots c_2]$  on y-axis.

For example, consider the following matrix of  $4 \times 5$ :

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20

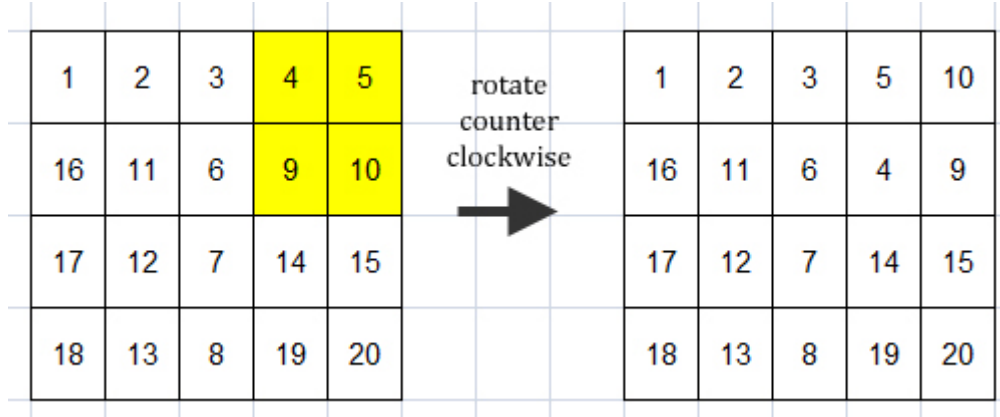
Supposed there are 4 queries, respectively:

- `rotate cw 2 1 2`  
Rotate the square submatrix  $A[2 \dots 2+2][1 \dots 1+2]$ , i.e.  $A[2 \dots 4][1 \dots 3]$  clockwise.



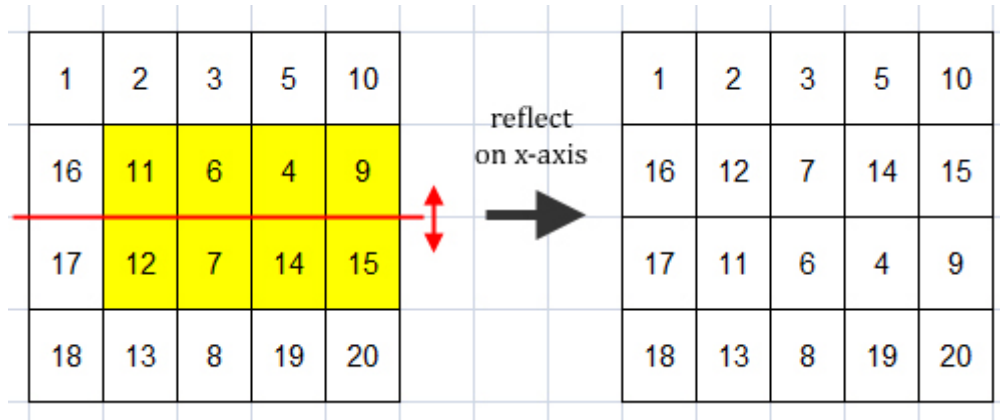
- rotate ccw 1 4 1

Rotate the square submatrix  $A[1 \dots 1+1][4 \dots 4+1]$ , i.e.  $A[1 \dots 2][4 \dots 5]$  clockwise.



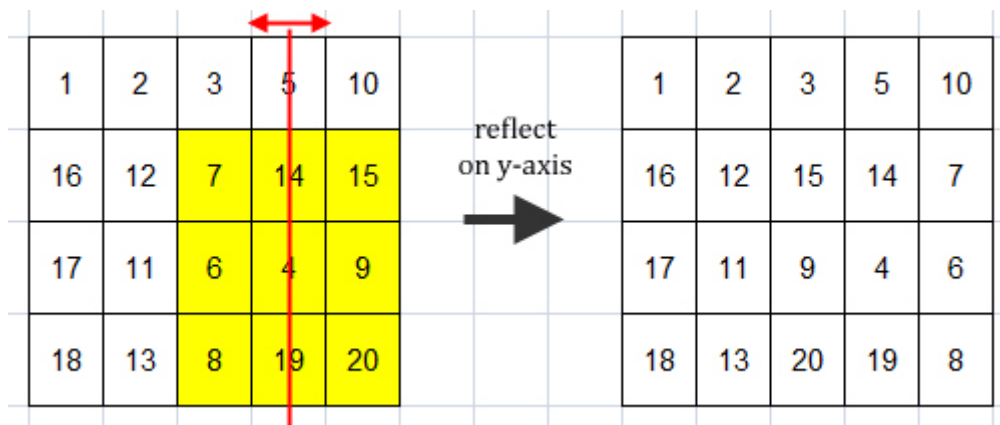
- reflect x 2 2 3 5

Reflect the submatrix  $A[2 \dots 3][2 \dots 5]$  on x-axis.



- reflect y 2 3 4 5

Reflect the submatrix  $A[2 \dots 4][3 \dots 5]$  on y-axis.



Thus, after those queries, the final matrix becomes:

1	2	3	5	10
16	12	15	14	7
17	11	9	4	6
18	13	20	19	8

Your task is to output the final matrix after all queries are executed sequentially.

## Input

The first line of input contains an integer  $T$  ( $T \leq 100$ ) denoting the number of cases. Each case begins with three integers  $N$   $M$  and  $Q$  ( $1 \leq N, M \leq 20$ ;  $1 \leq Q \leq 20$ ) denoting the matrix size ( $N \times M$ ) and number of queries, respectively. The next  $N$  lines, each contains  $M$  integers  $A_{i,j}$  ( $1 \leq A_{i,j} \leq 1,000$ ) representing the initial matrix. The next  $Q$  lines, each contains a query with one of the following format:

- rotate cw  $r$   $c$   $s$  ( $1 \leq r \leq r+s \leq N$ ;  $1 \leq c \leq c+s \leq M$ )
- rotate ccw  $r$   $c$   $s$  ( $1 \leq r \leq r+s \leq N$ ;  $1 \leq c \leq c+s \leq M$ )
- reflect x  $r_1$   $c_1$   $r_2$   $c_2$  ( $1 \leq r_1 \leq r_2 \leq N$ ;  $1 \leq c_1 \leq c_2 \leq M$ )
- reflect y  $r_1$   $c_1$   $r_2$   $c_2$  ( $1 \leq r_1 \leq r_2 \leq N$ ;  $1 \leq c_1 \leq c_2 \leq M$ )

## Output

For each case, output in a line "Case #X:" where X is the case number, starts from 1. The next N lines in each case, each contains M integers each separated by a single space. These integers represent the final matrix after all queries are executed sequentially.

**Sample Input**

```
2
4 5 4
1 2 3 4 5
6 7 8 9 10
11 12 13 14 15
16 17 18 19 20
rotate cw 2 1 2
rotate ccw 1 4 1
reflect x 2 2 3 5
reflect y 2 3 4 5
3 3 2
10 10 10
1 3 9
20 15 17
reflect x 1 1 3 3
rotate cw 1 1 2
```

**Output for Sample Input**

```
Case #1:
1 2 3 5 10
16 12 15 14 7
17 11 9 4 6
18 13 20 19 8
Case #2:
10 1 20
10 3 15
10 9 17
```