

# Problem D

## Damaging Your Spreadsheet (Spreadsheet Tracking II)

Data in spreadsheets are stored in cells, which are organized in rows ( $r$ ) and columns ( $c$ ). Some operations on spreadsheets can be applied to single cells ( $r,c$ ), while others can be applied to entire rows or columns. Typical cell operations include inserting and deleting rows or columns and exchanging cell contents.

Some spreadsheets allow users to mark collections of rows or columns for deletion, so the entire collection can be deleted at once. Some (unusual) spreadsheets allow users to mark collections of rows or columns for insertions too. Issuing an insertion command results in new rows or columns being inserted before each of the marked rows or columns.

Suppose, for example, the user marks rows 1 and 5 of the spreadsheet on the left for deletion, then marks columns 3, 6, 7, and 9 for deletion, the spreadsheet shrinks to spreadsheet on the right:

	A	B	C	D	E	F	G	H	I
1	22	55	66	77	88	99	10	12	14
2	2	24	6	8	22	12	14	16	18
3	18	19	20	21	22	23	24	25	26
4	24	25	26	67	22	69	70	71	77
5	68	78	79	80	22	25	28	29	30
6	16	12	11	10	22	56	57	58	59
7	33	34	35	36	22	38	39	40	41

	A	B	C	D	E
1	2	24	8	22	16
2	18	19	21	22	25
3	24	25	67	22	71
4	16	12	10	22	58
5	33	34	36	22	40

If the user marks rows 2, 3 and 5 for insertion, then marks column 3 for insertion, the spreadsheet grows to the one below:

	A	B	C	D	E	F
1	2	24		8	22	16
2						
3	18	19		21	22	25
4						
5	24	25		67	22	71
6	16	12		10	22	58
7						
8	33	34		36	22	40

Now that someone damaged your spreadsheet by issuing several insertion, deletion and exchange operations (details are described below).

Your task is to calculate the number of cells that are kept (not deleted), and the total distance between the original cells and their final locations. If a cell in  $(x_1, y_1)$  was moved to  $(x_2, y_2)$ , the total distance is increased by  $|x_1 - x_2| + |y_1 - y_2|$ . You also need to determine the final locations of some important data.

### Input

The input consists of a sequence of spreadsheets, operations on those spreadsheets, and queries about them. Each spreadsheet definition begins with a pair of integers specifying its initial number of rows ( $r$ ) and columns ( $c$ ), followed by an integer specifying the number ( $n$ ) of spreadsheet operations. Row and column labeling begins with 1. The following  $n$  lines specify the desired operations.  $1 \leq r, c \leq 5000$ ,  $1 \leq n \leq 50$ . There will be at least one row and one column at any time.

An operation to exchange the contents of cell  $(r_1, c_1)$  with  $(r_2, c_2)$  is given by: EX  $r_1 c_1 r_2 c_2$ . The four insert and delete commands--DC (delete columns), DR (delete rows), IC (insert columns), and IR (insert rows) are given by:  $\langle \text{command} \rangle A x_1 x_2 \dots x_A$ , where  $\langle \text{command} \rangle$  is one of the four commands;  $A$  is a positive integer not greater than 5, and  $x_1, \dots, x_A$  are the labels of the columns or rows to be deleted or inserted before. For each insert and delete command, the order of the rows or columns in the command has no significance. Within a single delete or insert command, labels will be unique.

The operations are followed by an integer  $Q(Q \leq 10000)$ , which is the number of queries for the spreadsheet. Each query consists of positive integers  $r$  and  $c$ , representing the row and column number of a cell in the original spreadsheet. For each query, your program must determine the current location of the data that was originally in cell  $(r, c)$ .

The end of input is indicated by a row consisting of a pair of zeros for the spreadsheet dimensions.

## Output

For each spreadsheet, your program must output its sequence number (starting at 1). In the next line, your program must output the number of cells that are kept, and the total move distance.

For each query, your program must output the original cell location followed by the final location of the data or the word GONE if the contents of the original cell location were destroyed as a result of the operations.

Separate output from different spreadsheets with a blank line.

## Sample Input

```
7 9
5
DR 2 1 5
DC 4 3 6 7 9
IC 1 3
IR 2 2 4
EX 1 2 6 5
4
4 8
5 5
7 8
6 5
0 0
```

## Output for the Sample Input

```
Spreadsheet #1
There are 25 cell(s) kept, total distance = 29
Cell data in (4,8) moved to (4,6)
Cell data in (5,5) GONE
Cell data in (7,8) moved to (7,6)
Cell data in (6,5) moved to (1,2)
```