Gothams railway track is made using rail blocks connected using joint bars. A rail block is made using two parallel rail and perpendicularly laid sleepers. In rail tracks a rail block can be connected to at most two other rail blocks. Several rail blocks are connected using joint bars to create a rail track.

In this problem you are going to work with N rail blocks numbered from 1 to N and will be given following three types of queries:

1 u v — connect block u and v ($1 \leq u, v \leq N$ and $u \neq v$) (any moment a block will be connected to at most two blocks).

2 u v — disconnect block u and v (it is ensured that this query will only disconnect existing connections). Two blocks u and v is considered connected if and only if there was a **1 u v** or **1 v u** query performed and no **2 u v** or **2 v u** query is performed after that.

3 u v — output the longest distance between u and v, distance between two blocks is equal to number of rail blocks in a path from u to v (including u, v). If there is no path then output '**-1**'.

Input

Input starts with an integer T ($T \leq 5$) denoting the number of test cases. First line of each test case contains two integers N ($2 \leq N \leq 10^5$) and Q ($1 \leq Q \leq 10^5$). The next Q lines contain queries as described above.

Output

For each case print the case number in the first line. Then for each query '**3 u v**' print the answer in separate line. See sample input output for more details.

Sample Input

```
1
5 6
1 1 2
1 3 4
1 1 3
3 1 4
2 3 4
3 1 4
```

Sample Output

```
Case 1:
3
-1
```