Navigation Nightmare

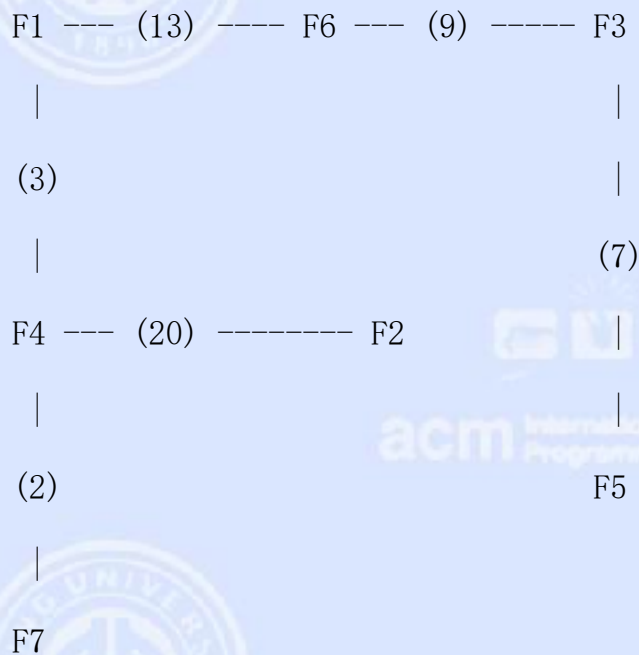**Time Limit:** 2000MS   **Memory Limit:** 30000K
Total Submissions: 5314   **Accepted:** 1988
Case Time Limit: 1000MS

Description

Farmer John's pastoral neighborhood has N farms (2 <= N <= 40,000), usually numbered/labeled 1..N. A series of M (1 <= M < 40,000) vertical and horizontal roads each of varying lengths (1 <= length <= 1000) connect the farms. A map of these farms might look something like the illustration below in which farms are labeled F1..F7 for clarity and lengths between connected farms are shown as (n):

```
        F1 --- (13) ---- F6 --- (9) ----- F3

         |                        |

        (3)                       |

         |                       (7)

        F4 --- (20) -------- F2   |

         |                        |

        (2)                      F5

         |

        F7
```

Being an ASCII diagram, it is not precisely to scale, of course.

Each farm can connect directly to at most four other farms via roads that lead exactly north, south, east, and/or west. Moreover, farms are only located at the endpoints of roads, and some farm can be found at every endpoint of every road. No two roads cross, and precisely one path (sequence of roads) links every pair of farms.

FJ lost his paper copy of the farm map and he wants to reconstruct it from backup information on his computer. This data contains lines like the following, one for every road:

There is a road of length 10 running north from Farm #23 to Farm #17
There is a road of length 7 running east from Farm #1 to Farm #17
...

As FJ is retrieving this data, he is occasionally interrupted by questions such as the following that he receives from his navigationally-challenged neighbor, farmer Bob:

What is the Manhattan distance between farms #1 and #23?

FJ answers Bob, when he can (sometimes he doesn't yet have enough data yet). In the example above, the answer would be 17, since Bob wants to know the "Manhattan" distance between the pair of farms.

The Manhattan distance between two points (x1,y1) and (x2,y2) is just |x1-x2| + |y1-y2| (which is the distance a taxicab in a large city must travel over city streets in a perfect grid to connect two x,y points).

When Bob asks about a particular pair of farms, FJ might not yet have enough information to deduce the distance between them; in this case, FJ apologizes profusely and replies with "-1".

Input

* Line 1: Two space-separated integers: N and M

* Lines 2..M+1: Each line contains four space-separated entities, F1,

    F2, L, and D that describe a road. F1 and F2 are numbers of

    two farms connected by a road, L is its length, and D is a

    character that is either 'N', 'E', 'S', or 'W' giving the

    direction of the road from F1 to F2.

* Line M+2: A single integer, K (1 <= K <= 10,000), the number of FB's

    queries

* Lines M+3..M+K+2: Each line corresponds to a query from Farmer Bob

    and contains three space-separated integers: F1, F2, and I. F1

    and F2 are numbers of the two farms in the query and I is the

    index (1 <= I <= M) in the data after which Bob asks the

    query. Data index 1 is on line 2 of the input data, and so on.

Output

* Lines 1..K: One integer per line, the response to each of Bob's

    queries.   Each line should contain either a distance

    measurement or -1, if it is impossible to determine the

appropriate distance.

Sample Input

```
7 6
1 6 13 E
6 3 9 E
3 5 7 S
4 1 3 N
2 4 20 W
4 7 2 S
3
1 6 1
1 4 3
2 6 6
```

Sample Output

```
13
-1
10
```

Hint

At time 1, FJ knows the distance between 1 and 6 is 13.
At time 3, the distance between 1 and 4 is still unknown.
At the end, location 6 is 3 units west and 7 north of 2, so the distance is 10.

Source

USACO 2004 February

[Submit]   [Go Back]   [Status]   [Discuss]