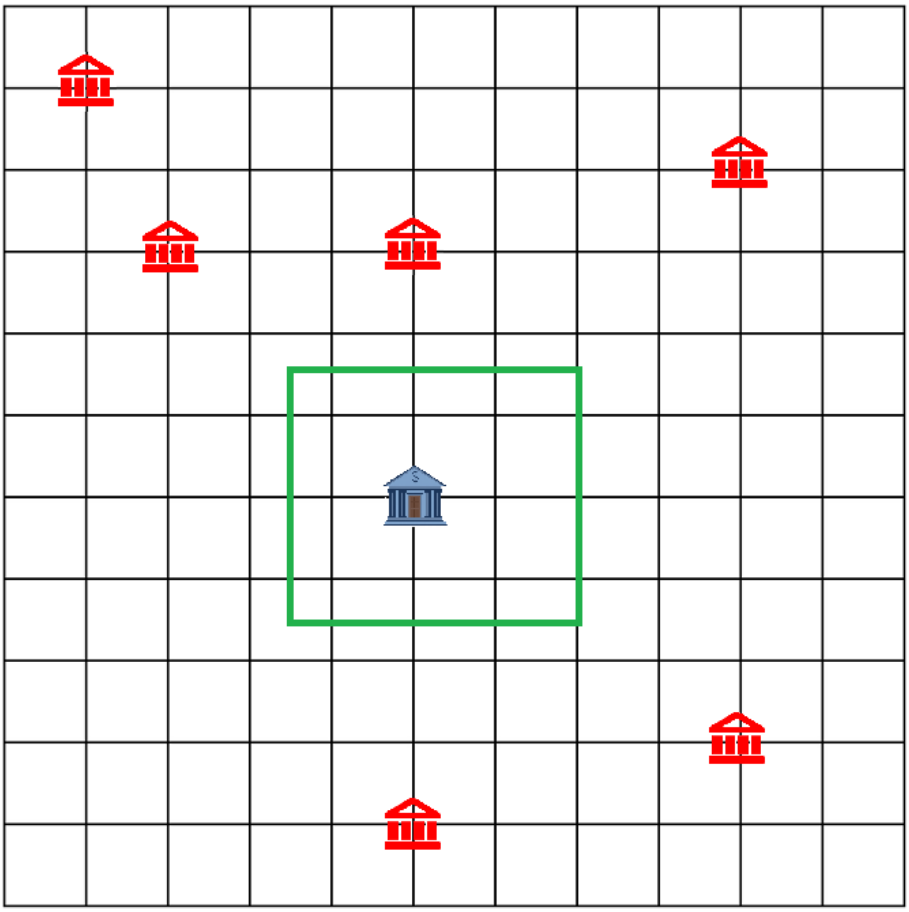
Rdist

Mr Vien is a great tycoon. It is said that:

"Where Vien drops a wallet, a bank pops up. Where the bank pops up, a new nation is built"

Suppose the Earth is a Cartesian plane

Define $R(x, y)$ as the territory of the country whose bank is placed at (x, y). This territory include every point **(integral or not)** (x', y') that satisfies: $|x - x'| \leq |x_1 - x'|$ và $|y - y'| \leq |y_1 - y'|$ for every points (x_1, y_1) that accomodates another bank.

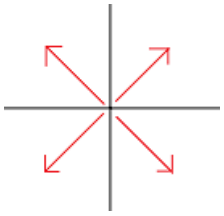


Define $D(P, A)$ for $P = (u, v)$ as the shortest distance from (u, v) to A. In other words, $D(P, A) = min(|u - x| + |v - y|) \forall (x, y) \in A$.

Define $G(u, v, S_0, S_1)$ $(S_0, S_1 \in \{$" <= ", " >= "$\})$ as points in the "S_0S_1-quadrant" of (u, v). In other words: $G(u, v, S_0, S_1) = \{(u', v') \mid u' S_0 u \ \& \ v' S_1 v\}$

You have to process queries of 2 types:

- 1 x y: Vien drops a wallet while travelling to (x, y), i.e., A bank appears at (x, y) and a nation is built accordingly.
- 2 u v S_0 S_1 ($S_0, S_1 \in \{$" <= ", " >= "$\}$): Vien is currently at the point $P = (u, v)$ and he wants to visit the furthest country possible in the S_0S_1 quadrant. In other words, you need to calculate: $max(D(P, R'(x, y))$ $(R'(x, y) = R(x, y) \cap G(u, v, S_1, S_2))$ for every points (x, y) that accomodates a bank.



Note: The creation of a nation may change the territory of one or several other nations.

Input

- The first line has integer T - the subtask containing the test.
- The second line has integer Q - the number of queries.
- Q lines contains a query 1 x y or 2 u v S_0 S_1

Output

Due to the large size of the output, you should print an **integer**: the sum of **two times** of the answers to the type 2 queries. For queries where Vien cannot reach any country, the answer is -1 (**not** multiplied by 2).

Constraints

- $Q \leq 250,000$
- $0 \leq x, y, u, v \leq 100,000,000$
- It is guaranteed that there is at least one query of each type, and the first query is of type 1.

Subtask

- Subtask 1 (15%): All x coordinate of the banks are equal.
- Subtask 2 (15%): $Q \leq 1000$
- Subtask 3 (20%): All type 1 queries come before any type 2 queries.
- Subtask 4 (20%): All x coordinates are different and all y coordinates are different.
- Subtask 3 (30%): No additional constraints.

Sample

Input

```
2
16
1 2 2
1 8 7
1 14 5
2 9 1 >= >=
1 4 6
1 2 8
1 10 8
1 11 3
2 16 10 >= >=
1 5 3
1 4 1
1 7 5
1 7 8
2 11 5 <= <=
2 3 5 >= <=
2 7 3 <= >=
```

Output

```
66
```

Explanation: The answers of the queries are:

```
5
-1
10.5
9.5
8.5
```