Liars and Truth Tellers

After spending so much time around his cows, Farmer John has started to understand their language. Moreover, he notices that among his N cows (2 <= N <= 1000), some always tell the truth while others always lie.

FJ carefully listens to M statements (1 <= M <= 10,000) from his cows, each of the form "x y T", meaning that "cow x claims cow y always tells the truth" or "x y L", meaning that "cow x claims cow y always tells lies". Each statement involves a pair of different cows, and the same pair of cows may appear in multiple statements.

Unfortunately, FJ believes he might have written down some entries in his list incorrectly, so there may not be a valid way to designate each cow as a truth teller or a liar that is consistent with all the M statements on FJ's list. To help FJ salvage as much of his list as possible, please compute the largest value of A such that there exists a valid way to designate each cow as a truth teller or a liar in a manner that is consistent with the first A entries in FJ's list.

INPUT FORMAT:

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

* Lines 2..1+M: Each line is of the form "x y L" or "x y T",

    describing a statement made by cow x about cow y.

SAMPLE INPUT:

4 3

1 4 L

2 3 T

4 1 T

INPUT DETAILS:

There are 4 cows and 3 statements. Cow 1 says that cow 4 lies, cow 2 says that cow 3 tells the truth, and cow 4 says that cow 1 tells the truth.

OUTPUT FORMAT:

* Line 1: The maximum value of A such that the first A entries in FJ's

list can be consistent with some assignment of "truth teller"

or "liar" to the N cows.

SAMPLE OUTPUT:

2

OUTPUT DETAILS:

Statements 1 and 3 cannot both be satisfied at the same time, but statements 1 and 2 can be, if we let cows 1..3 tell the truth and cow 4 be a liar.

Party Invitations

Farmer John is throwing a party and wants to invite some of his cows to show them how much he cares about his herd. However, he also wants to invite the smallest possible number of cows, remembering all too well the disaster that resulted the last time he invited too many cows to a party.

Among FJ's cows, there are certain groups of friends that are hard to separate. For any such group (say, of size k), if FJ invites at least k-1 of the cows in the group to the party, then he must invite the final cow as well, thereby including the entire group. Groups can be of any size and may even overlap with each-other, although no two groups contain exactly the same set of members. The sum of all group sizes is at most 250,000.

Given the groups among FJ's cows, please determine the minimum number of cows FJ can invite to his party, if he decides that he must definitely start by inviting cow #1 (his cows are conveniently numbered 1..N, with N at most 1,000,000).

INPUT FORMAT:

* Line 1: Two space-separated integers: N (the number of cows), and G

    (the number of groups).

* Lines 2..1+G: Each line describes a group of cows. It starts with

    an integer giving the size S of the group, followed by the S

    cows in the group (each an integer in the range 1..N).

SAMPLE INPUT:

10 4

2 1 3

2 3 4

6 1 2 3 4 6 7

4 4 3 2 1

INPUT DETAILS:

There are 10 cows and 4 groups. The first group contains cows 1 and 3, and so on.

OUTPUT FORMAT:

* Line 1: The minimum number of cows FJ can invite to his party.

SAMPLE OUTPUT:

4

OUTPUT DETAILS:

In addition to cow #1, FJ must invite cow #3 (due to the first group constraint), cow #4 (due to the second group constraint), and also cow #2

Island Travels

Farmer John has taken the cows to a vacation out on the ocean! The cows are living on N (1 <= N <= 15) islands, which are located on an R x C grid (1 <= R, C <= 50). An island is a maximal connected group of squares on the grid that are marked as 'X', where two 'X's are connected if they share a side. (Thus, two 'X's sharing a corner are not necessarily connected.)

Bessie, however, is arriving late, so she is coming in with FJ by helicopter. Thus, she can first land on any of the islands she chooses. She wants to visit all the cows at least once, so she will travel between islands until she has visited all N of the islands at least once.

FJ's helicopter doesn't have much fuel left, so he doesn't want to use it until the cows decide to go home. Fortunately, some of the squares in the grid are shallow water, which is denoted by 'S'. Bessie can swim through these squares in the four cardinal directions (north, east, south, west) in order to travel between the islands. She can also travel (in the four cardinal directions) between an island and shallow water, and vice versa.

Find the minimum distance Bessie will have to swim in order to visit all of the islands. (The distance Bessie will have to swim is the number of distinct times she is on a square marked 'S'.) After looking at a map of the area, Bessie knows this will be possible.

INPUT FORMAT:

* Line 1: Two space-separated integers: R and C.

* Lines 2..R+1: Line i+1 contains C characters giving row i of the

grid. Deep water squares are marked as '.', island squares are

marked as 'X', and shallow water squares are marked as 'S'.

SAMPLE INPUT:

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5 4
XX.S
.S..
SXSS
S.SX
..SX
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INPUT DETAILS:

There are three islands with shallow water paths connecting some of them.

OUTPUT FORMAT:

* Line 1: A single integer representing the minimum distance Bessie

    has to swim to visit all islands.

SAMPLE OUTPUT:

3

OUTPUT DETAILS:

Bessie can travel from the island in the top left to the one in the middle, swimming 1 unit, and then travel from the middle island to the one in the bottom right, swimming 2 units, for a total of 3 units.

Seating

To earn some extra money, the cows have opened a restaurant in their barn specializing in milkshakes. The restaurant has N seats (1 <= N <= 500,000) in a row. Initially, they are all empty.

Throughout the day, there are M different events that happen in sequence at the restaurant (1 <= M <= 300,000). The two types of events that can happen are:

1. A party of size p arrives (1 <= p <= N). Bessie wants to seat the party in a contiguous block of p empty seats. If this is possible, she does so in the lowest position possible in the list of seats. If it is impossible, the party is turned away.

2. A range [a,b] is given (1 <= a <= b <= N), and everybody in that range of seats leaves.

Please help Bessie count the total number of parties that are turned away over the course of the day.

INPUT FORMAT:

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

* Lines 2..M+1: Each line describes a single event. It is either a

line of the form "A p" (meaning a party of size p arrives) or

"L a b" (meaning that all cows in the range [a, b] leave).

SAMPLE INPUT:

10 4

A 6

L 2 4

A 5

A 2

INPUT DETAILS:

There are 10 seats, and 4 events. First, a party of 6 cows arrives. Then all cows in seats 2..4 depart. Next, a party of 5 arrives, followed by a party of 2.

OUTPUT FORMAT:

* Line 1: The number of parties that are turned away.

SAMPLE OUTPUT:

1

OUTPUT DETAILS:

Party #3 is turned away. All other parties are seated.