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D - Suddenly, A Tempest

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Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 425 points

Problem Statement

There is an infinitely large two-dimensional grid. The color of cell (x, y) is black if $0 \leq x \leq X - 1$ and $0 \leq y \leq Y - 1$, and white otherwise.

N great storms occur in order on this grid. The i -th great storm updates the color of each cell on the grid according to a rule represented by a character C_i and integers A_i, B_i .

In the i -th great storm, the color of cell (x, y) after the great storm is:

- In case C_i is x ,
 - if $x < A_i$, it becomes the color of cell $(x, y + B_i)$ before the great storm;
 - if $x \geq A_i$, it becomes the color of cell $(x, y - B_i)$ before the great storm.
- In case C_i is y ,
 - if $y < A_i$, it becomes the color of cell $(x + B_i, y)$ before the great storm;
 - if $y \geq A_i$, it becomes the color of cell $(x - B_i, y)$ before the great storm.

Two black cells $(x_1, y_1), (x_2, y_2)$ are **adjacent** if and only if $|x_1 - x_2| + |y_1 - y_2| = 1$. Also, two black cells c_1, c_2 are **connected** if and only if one can move from cell c_1 to cell c_2 by repeatedly moving to adjacent black cells.

A non-empty set S of black cells is a **connected component** if and only if S satisfies the following conditions:

- Any two cells in S are connected.
- Every black cell not in S is not connected to any cell in S .

For the grid after all N great storms have occurred, find the number of connected components and output the number of cells in each connected component **in ascending order**.

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Constraints

- N, X, Y are integers.
- $1 \leq N \leq 14$
- $1 \leq X, Y \leq 10^8$
- C_i is x or y.
- A_i, B_i are integers.
- $-10^8 \leq A_i, B_i \leq 10^8$

Input

The input is given from Standard Input in the following format:

```
N X Y
C1 A1 B1
⋮
CN AN BN
```

Output

Output two lines.

The first line should contain the number of connected components consisting of black cells.

The second line should contain the number of cells in each connected component, space-separated, in ascending order.

Sample Input 1

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```
2 3 5
X 2 2
Y -1 1
```

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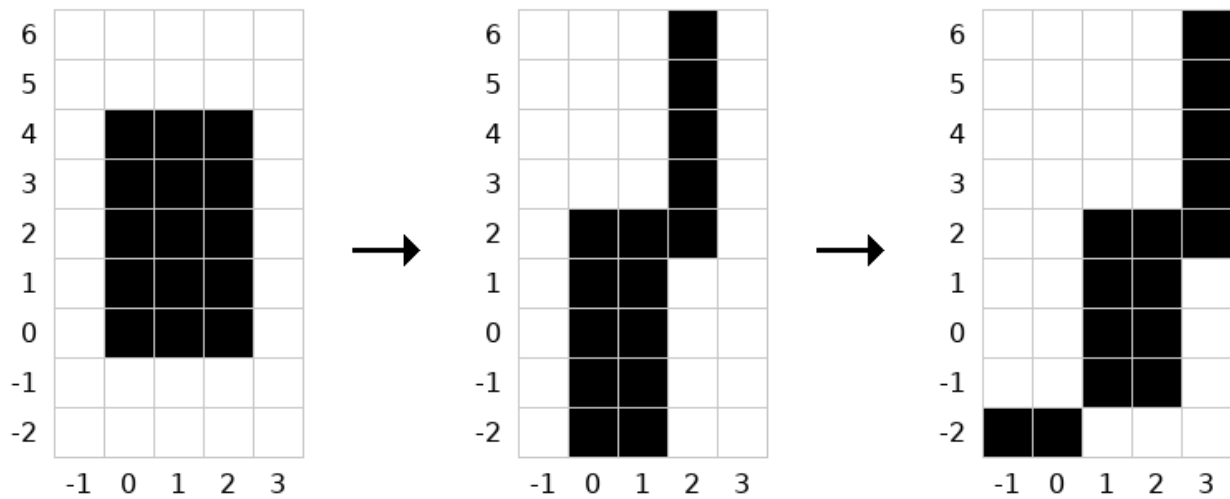
Sample Output 1

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```
2
2 13
```

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The grid changes as shown in the following image due to the great storms (the rightward direction is the positive direction of the x -axis, and the upward direction is the positive direction of the y -axis).



In the final grid, the following two connected components exist:

- A connected component consisting of cells $(-1, -2), (0, -2)$.
- A connected component consisting of cells $(1, -1), (1, 0), (1, 1), (1, 2), (2, -1), (2, 0), (2, 1), (2, 2), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6)$.

Note that the number of cells in each connected component must be output **in ascending order**.

Sample Input 2

Copy

14 68875272 94216928
X 1630731 32914676
X 17164413 -33684569
X 26798060 5418308
X 34094469 -45675954
X 43889566 34125482
X 56836569 -22217058
X 64045210 27857939
Y -54561094 11587606
Y 93548188 32214521
Y -77361096 25750481
Y 27724899 1810420
Y 80945185 -7871305
Y 14782822 -2565089
Y 54687684 -22884393

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Sample Output 2

Copy

8 Copy
21105046168287 22050167303226 33624667752182 223328231190194 441936776830492 1141371400772596 1

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The output value may not fit in a 32-bit integer.

