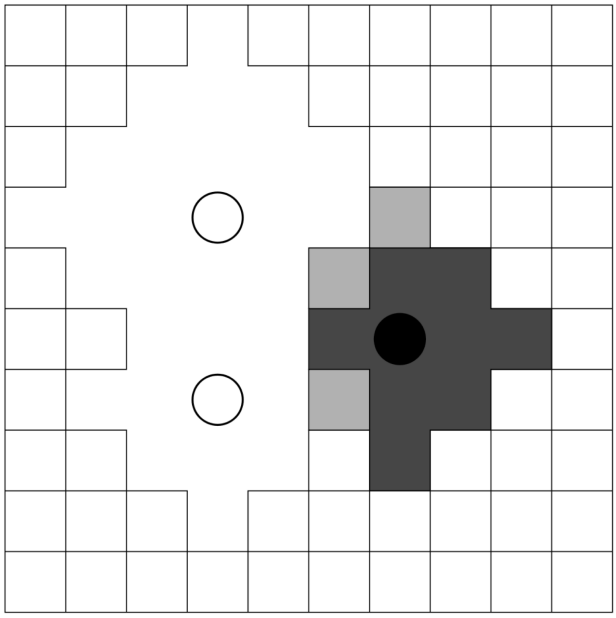
IOI Team Training 2013 – Online Test 9, 9–10 June, 2013

Dominance

Imagine the land of Bugtopia as a grid of $W \times H$ squares. Bugtopia is inhabited by white and black bugs. Each square is either inhabited by white bugs only (we call such a square a "white square") or by black bugs only (a "black square") or not inhabited at all. White bugs are pretty aggressive against black bugs, and vice versa. Each kind wants to dominate Bugtopia. For that purpose, the bugs move along the grid; a move to a vertically or horizontally adjacent square is counted as one step. Thus, the bugs of one square are able to attack other squares if they can reach them with no more than a certain number of steps. This "range" depends on their square; different squares provide different living conditions. We say that a square is dominated by the white bugs if it can be attacked from more white squares than black squares. Similarly, a square is dominated by the black bugs if it can be attacked from more black than white squares. Note that a square is called neutral if it can be attacked from no square or from equally many white and black squares.



This picture shows two white squares (marked with a white circle) with ranges 3 and 2, as well as one black square (marked with a black circle) with range 2. The white bugs dominate 30 squares, the black bugs dominate 9 squares. The three squares colored in light gray can be attacked, but are neutral and therefore not dominated by any kind of bugs.

Given the size of the grid and the positions, colors, and ranges of the inhabited squares, output the total number of squares dominated by each kind of bugs.

Program and Grader

Implement one function in the file `dominance.cpp`

```
long long* countSqrs(int W, int H, int N, char* C, int* X, int* Y, int* R);
```

that returns a 2 element array, the first element being the number of squares that are dominated by white bugs, the second element being the number of squares dominated by black bugs, given `W` is the width of the grid, `H` is the height of the grid, `N` is the number of bug-inhabited squares, and `C`, `X`, `Y` and `R` are N-element arrays describing the bug-inhabited squares, where for each `i` in `[1..N]`, `C[i]` $\in$ {`'W'`,`'B'`} denotes the colour of square `i`, `X[i]` and `Y[i]` are the x and y coordinates of square `i`, respectively, and `R[i]` is the range of the bugs in square `i`.

Input and Output

The program `grader_dominance.cpp` takes input in the following format:

- The first line has two integers: W and H.
- The second line has one integer: N.
- This is followed by N lines, each consisting of one character, `C[i]`, and three integers `X[i]`, `Y[i]` and `R[i]`, describing a bug-inhabited square.

`grader_dominance.cpp` then calls your function `countSqrs()` and outputs the two integers that your function returns.

Test data

In all test cases, $0 \leq N \leq 3000$, $0 \leq X[i] < W$, $0 \leq Y[i] < H$, and $0 \leq R[i] < 500,000,000$. The squares' ranges will never reach beyond the borders of Bugtopia.

- Subtask 1 (30 marks) : $1 \leq W, H \leq 2000$
- Subtask 2 (70 marks) : $1 \leq W, H \leq 1,000,000,000$

Sample input

```
10 10
3
W 3 6 3
B 6 4 2
W 3 3 2
```

Sample output

```
30 9
```

Limits

- *Memory limit* : 128 MB
- *Time limit* : 4s