[D5] Fanception-ception (500 pts)

Time Limit: 2s
Memory Limit: 512MB

IMPORTANT: Please use fast I/O (`scanf/printf` for C++, `BufferedReader/StringBuilder` for Java) to process the test cases.

Problem Description

"Any way the wind blows, doesn't really matter to me."
@FR3Dd1EHg, Rocker Hacker of Queens, New York

Rival hacker alert! Frederick Quicksilver, also known as *@FR3Dd1EHg* is a popular rocker/hacker/fan aficionado, famous for hits such as "Fat-Bottomed Air Conditioners", "Another One Blows The Fan", "Asahi to Love", and many others. To to promote their newest single "Brhoohreemrrriaan Rrhaapsroodryyy" (best sung in front of an electric fan), they have issued a challenge/puzzle to all other hackers in the cyberspace — they have hacked a $N \times N$ section of Queens, New York; remotely controlling all industrial electric fans on each cell!

Each location (i, j) on that section has a fan pointed to a certain cardinal direction (north, east, west, south, or turned off) with a certain strength F_{ij}. This fan strength causes wind pressure of that direction to spread out from the location in a triangular manner, like so:

```
111111
.22222
..333.
...4..
......
......
```

Figure 1: The wind pressure applied by a fan of strength 4 at the coordinates $(4, 4)$ pointing North on the 6×6 map of Queen. Note that all resulting wind pressures from this fan point to North.

As these fans cause wind pressure to blow all over, @thanswerisblanc wants to find the *cumulative wind pressure* on each cell of the map for each direction. The cumulative wind pressure, C_{ij}, on a cell (i, j) can

be calculated by adding all wind pressure applied on the cell from *all the fans that affect it*. Note that wind pressure of the opposite directions cancel each other out (i.e. adding wind pressures of 5E and 6W on the same cell result in the wind pressure pointing east to cancel out and leave 1W). Consequently, orthogonal wind pressures do not affect each other (i.e. strengths of 5E and 6N on the same cell will simply result in 5E, 6N).

Given an $N \times N$ map of the section of Queens *@FR3Dd1EHg* has remotely controlled, with each cell (i, j) of which having a fan with strength F_{ij} and pointing to one of the cardinal directions (or turned off), calculate the *cumulative wind pressure* C_{ij} across all cells of the map.

Input Specification

There is only one test case per file.

The test file starts with one line containing a positive integer N, the size of the map of Queens, N.Y. in N rows and N columns.

N lines then follow, each containing N space-separated integers. The j^{th} integer on the i^{th} line denotes the strength of the fan F_{ij}, at location (i, j).

Another N lines then follow, each containing a string of length N. The j^{th} character on the i^{th} line denotes the direction of the fan F_{ij}, at location (i, j):

1. `N`: The fan is pointing North.
2. `E`: The fan is pointing East.
3. `S`: The fan is pointing South.
4. `W`: The fan is pointing West.
5. `.`: The fan is turned off in this location (the fan is of strength 0).

Output Specification

The output starts with N lines, each containing N space-separated integers. The j^{th} integer on the i^{th} line denotes the cumulative wind pressure pointing **North** $C_{ij,N}$.

The output then follows with N lines, each containing N space-separated integers. The j^{th} integer on the i^{th} line denotes the cumulative wind pressure pointing **East** $C_{ij,E}$.

The output then follows with N lines, each containing N space-separated integers. The j^{th} integer on the i^{th} line denotes the cumulative wind pressure pointing **South** $C_{ij,S}$.

The output then follows with N lines, each containing N space-separated integers. The j^{th} integer on the i^{th} line denotes the cumulative wind pressure pointing **West** $C_{ij,W}$.

Constraints

$1 \leq N \leq 1000$

$0 \leq F_{ij} \leq 50$

Fan direction can only be one of `N`,`E`,`S`,`W`,`.`.

If a fan is turned off, F_{ij} will always be 0 (and vice-versa).

Sample Input

```
4
0 0 0 0
0 3 3 0
0 3 3 0
0 0 0 0
....
.ES.
.NW.
....
```

Sample Output

```
1 1 1 1
2 2 0 0
0 1 0 0
0 0 0 0
0 0 2 1
0 1 2 1
0 0 0 1
0 0 0 1
0 0 0 0
0 0 1 0
0 0 2 2
1 1 1 1
1 0 0 0
1 0 0 0
1 2 1 0
1 2 0 0
```

Explanation

Each fan contributes the following wind pressure as presented below:

```
1 1 1 1   0 0 2 1   0 0 0 0   1 0 0 0
2 2 2 0   0 3 2 1   0 0 3 0   1 2 0 0
0 3 0 0   0 0 2 1   0 2 2 2   1 2 3 0
0 0 0 0   0 0 0 1   1 1 1 1   1 2 0 0
```

Figure 2: North, East, South, West wind pressures respectively

When combining opposite direction, the ffdirections get cancelled:

- North-facing wind pressure gets cancelled out completely at (3,2) and reduced at (2,3)
- East-facing wind pressure gets cancelled out completely at (3,3) and reduced at (2,2)
- South-facing wind pressure gets cancelled out completely at (2,3) and reduced at (3,2)
- West-facing wind pressure gets cancelled out completely at (2,2) and reduced at (3,3)

This results in the sample output.