F2 - Reachable Cells

Editorial (/contests/agc028/tasks/agc028_f2/editorial)

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Time Limit: 9 sec / Memory Limit: 1024 MB

Score : 1500 points

Problem Statement

Problem F and F2 are the same problem, but with different constraints and time limits.

We have a board divided into N horizontal rows and N vertical columns of square cells. The cell at the i-th row from the top and the j-th column from the left is called Cell (i, j). Each cell is either empty or occupied by an obstacle. Also, each empty cell has a digit written on it. If $A_{i,j} =$ `'1'`, `'2'`, ..., or `'9'`, Cell (i, j) is empty and the digit $A_{i,j}$ is written on it. If $A_{i,j} =$ `'#'`, Cell (i, j) is occupied by an obstacle.

Cell Y is *reachable* from cell X when the following conditions are all met:

- Cells X and Y are different.
- Cells X and Y are both empty.
- One can reach from Cell X to Cell Y by repeatedly moving right or down to an adjacent empty cell.

Consider all pairs of cells (X, Y) such that cell Y is reachable from cell X. Find the sum of the products of the digits written on cell X and cell Y for all of those pairs.

Constraints

- $1 \leq N \leq 1500$
- $A_{i,j}$ is one of the following characters: `'1'`, `'2'`, ... `'9'` and `'#'`.

Input

Input is given from Standard Input in the following format:

N
$A_{1,1}A_{1,2}\ldots A_{1,N}$
$A_{2,1}A_{2,2}\ldots A_{2,N}$
:
$A_{N,1}A_{N,2}\ldots A_{N,N}$

Output

Print the sum of the products of the digits written on cell X and cell Y for all pairs (X, Y) such that cell Y is reachable from cell X.

Sample Input 1 Copy

Copy

```
2
11
11
```

Sample Output 1 Copy

Copy

```
5
```

There are five pairs of cells (X, Y) such that cell Y is reachable from cell X, as follows:

- $X = (1, 1), Y = (1, 2)$
- $X = (1, 1), Y = (2, 1)$
- $X = (1, 1), Y = (2, 2)$
- $X = (1, 2), Y = (2, 2)$
- $X = (2, 1), Y = (2, 2)$

The product of the digits written on cell X and cell Y is 1 for all of those pairs, so the answer is 5.

Sample Input 2 Copy

Copy

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```
4
1111
11#1
1#11
1111
```

Sample Output 2 Copy

```
47
```

Sample Input 3 Copy

```
10
76##63##3#
8445669721
75#9542133
3#285##445
749632##89
2458##9515
5952578#77
1#3#44196#
4355#99#1#
#298#63587
```

Sample Output 3 Copy

```
36065
```

Sample Input 4 Copy

```
10
4177143673
7#########
5#1716155#
6#4#####5#
2#3#597#6#
6#9#8#3#5#
5#2#899#9#
1#6#####6#
6#5359657#
5#########
```

Sample Output 4 Copy

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