# Air Traffic Control II (atc2)

You may recall that Edoardo, who has recently been hired by the Municipality of Milan as an Air Traffic Control Operator, is working on the *paper-plane project*. He has already built $T$ control towers and shot down every obstacle to ease the flight of the planes. However, the project is still not going well: there are too many other things in the air at the same time as the paper planes!

Edoardo has been working closely with the authorities in order to work out a solution, and the only option available is to pay for reserving some *air corridors* for the sole use of this project.

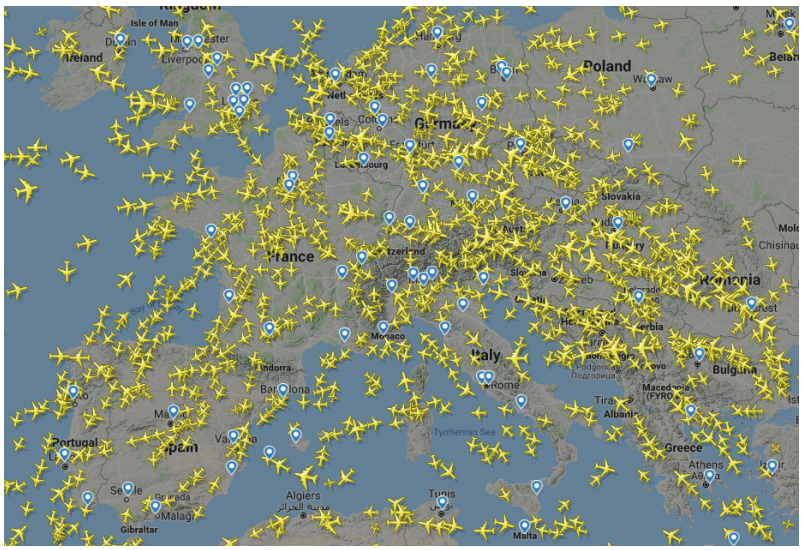


Figure 1: Real air traffic in Europe on a Friday morning (source: *FlightRadar24*).

Milan can be represented by a square grid of size $N \times N$, where each cell can be either:

- an empty space, represented with a "`.`" in input;
- a control tower, represented with a "`T`" in input.

The control tower placed on cell $(i_1, j_1)$ can throw a paper plane towards any other control tower placed on cell $(i_2, j_2)$, using a dedicated air corridor. The reservation of such a corridor costs $(i_2 - i_1)^2 + (j_2 - j_1)^2$ euros.

Since booking air corridors is quite expensive, Edoardo wants to reserve only some of them, in such a way that makes possible for each tower to exchange paper planes with every other tower, possibly through some intermediate towers. What is the *minimum* cost that he has to pay?

> ☞ Among the attachments of this task you may find a template file `atc2.*` with a sample incomplete implementation.

## Input

The first line contains one integer $N$, the size of the grid. The next $N$ lines contain $N$ characters each. The first character of the first line represents position $(1, 1)$ of the grid. The last character of the last line represents position $(N, N)$.

## Output

You need to write a single line with an integer: the minimum cost required to reserve the air corridors needed for the project.

## Constraints

- $2 \leq N \leq 3000$.
- The number of control towers in the map is at least 2 and does not exceed 3000.

## Scoring

Your program will be tested against several test cases grouped in subtasks. In order to obtain the score of a subtask, your program needs to correctly solve all of its test cases.

– **Subtask 1** (0 points) Examples.

– **Subtask 2** (10 points) $N = 2$.

– **Subtask 3** (45 points) $N \leq 1000$ and the number of control towers does not exceed 300.

– **Subtask 4** (30 points) $N \leq 1000$.

– **Subtask 5** (15 points) No additional limitations.

## Examples

| input | output |
|---|---|
| 4<br>T...<br>....<br>....<br>...T | 18 |
| 5<br>...T.<br>.....<br>..T..<br>.....<br>....T | 13 |

## Explanation

In the **first sample case**, the only choice is to reserve an air corridor between $(1, 1)$ and $(4, 4)$ at cost $(4-1)^2 + (4-1)^2 = 18$.

In the **second sample case**, the cheapest choice is to reserve an air corridor between $(1, 4)$ and $(3, 3)$ at cost $(3-1)^2+(3-4)^2 = 5$, and another air corridor between $(3, 3)$ and $(5, 5)$ at cost $(5-3)^2+(5-3)^2 = 8$, for a total cost of 13.