Problem 1: MATE

Time Limit: 1 second
Memory Limit: 256 MB

Problem Statement

Shane likes to $\mathbb{MATE}$.

Shane has a R by C grid, where each cell in the grid is denoted by coordinates (x, y). The top left cell has coordinates $(1, 1)$ and the bottom right cell has coordinates (R, C). Shane can travel on this grid by teleporting. But teleporting takes time, namely for 2 cells P and Q, the time needed to teleport from P to Q is equal to its Manhattan distance which is calculated as $|P_x - Q_x| + |P_y - Q_y|$.

Each cell in the grid has one of the letters of $\mathbb{MATE}$. Shane wants to teleport the grid so that he start on a cell with letter $\mathbb{M}$, then teleport to a cell with letter $\mathbb{A}$, followed by teleporting to a cell with letter $\mathbb{T}$, and finally teleporting to a cell with letter $\mathbb{E}$.

Shane can start from any cell that he chooses. Help Shane find the shortest time he needs to travel to $\mathbb{MATE}$.

Input Format

On the first line you will be given 2 space integers R and C.
The following R lines will contain C characters. Each character is guaranteed to be either $\mathbb{M}$, $\mathbb{A}$, $\mathbb{T}$ or $\mathbb{E}$.

Output Format

Output only 1 integer, the shortest time Shane needs to teleport to $\mathbb{MATE}$.

It is guaranteed that Shane can always $\mathbb{MATE}$.

Subtasks

For all subtasks, $1 \le R, C, R \cdot C \le 1000000$

Subtask 1: $R, C, R \cdot C \le 4$ (4 marks)
Subtask 2: $R, C, R \cdot C \le 4000$ (27 marks)
Subtask 3: There are no further constraints (69 marks)
Subtask 4: Sample test cases (0 marks)

Sample Test cases

Sample Input 1

```
4 4
MATE
MATE
MATE
MATE
```

Sample Output 1

```
3
```

Sample Input 2

```
2 2
MA
TE
```

Sample Output 2

```
4
```

Sample Input 3

```
1 12
ATTTTMMTTTTE
```

Sample Output 3

```
16
```