

Keep It Dry (500pts)

Time Limit: 3s
Memory Limit: 512MB

Problem Description

After a long day at work, Richard prepares to leave the office. But before he can walk away, a loud ****CRASH**** reverberates throughout the office! Apparently, the staff at Amgat Dam have decided to open the bypass valve to end the water shortage. Unknown to everyone, this bypass valve is directly connected the bidets at the office. This destroys some of the plumbing and now water is flooding in from multiple spots!

Fortunately, Richard knows the layout of the office by heart, and knows the exits that can lead him to a safe location. However, the water will flow into different parts of the office over time – he needs to get to an exit while avoiding the incoming flow of water. He has a copy of the office floor plan, and with his quick pro-level (and near expert) skills, he can (hopefully) find a way out.

The floor plan is described using a strange legend:

- . -> Free/Empty space
- # -> Obstacle
- W -> Leak
- E -> Exit
- R -> Richard

An example layout would look like this:

```
#.E  
.#.  
W.R
```

Richard also knows that the following rules apply:

- He can't step onto obstacles or any area with water in it
- He can only step up, down, left, and right
- Richard makes the first move. After every step he takes, the water spreads out in all directions (up, down, left, right). This means that all cells adjacent to a cell with water will be flooded in the next step. Water can't pass through obstacles, but it can flood exits.
- If water spreads to where Richard is located before he reaches an exit, he will become wet.

Can Richard find a way out of the office before he gets wetter than he would ever wish to be?

Input Specification

The first line contains an integer T , denoting the number of test cases.

Each test case is composed of the following: - A line containing the numbers N, M , the height and width of the office, respectively - N lines containing M characters each, describing the layout of the office given by the legend.

Output Specification

For each test case, output a line containing a number denoting the least amount of steps Richard needs to take to safely exit the office. If Richard can't escape, output a -1 .

Constraints

$1 \leq N, M \leq 10^6$

Sum of all $N \times M$ of all test cases is up to 10^6 .

There is exactly 1 R and at least 1 E and 1 W in the grid.

Sample Input

```
6
4 2
..
ER
W#
#.
3 3
#.#
.#E
W.R
2 5
RW.##
#..E.
1 10
.E...RW.E
4 2
#.
..
RE
.W
1 10
E#W..E...R
```

Sample Output

```
1
1
-1
5
1
-1
```

Explanation

In the first test case, Richard can move left towards an exit. After this, water spreads in all 4 directions, but because Richard has already reached an exit, he is safe.

An illustration of how water spreads can be seen step-by-step below:

```
.....
..#W..
.....
...#..
.....

...W..
..#WW.
...W..
...#..
.....

..WWW.
..#WWW
..WWW.
...#..
.....

.WWWW
..#WWW
.WWWW
..W#W.
.....
```