Problem 184: aMAZEing

Difficulty: Hard

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Problem Background

Mazes have been of interest to the human race for years. The English word "maze" comes from an old English word meaning delirium or delusion. While mazes and labyrinths are not really the same, they are frequently used synonymously. A labyrinth is usually many winding, curved passages, while mazes are more like a puzzle and have many dead ends. We have ancient Greek mythology with heroes escaping from monsters in a labyrinth. The English built hedge mazes in the gardens of many of their castles. Today, many farmers will build mazes in corn fields after the harvest.

Solving a maze can be fun and that's exactly what this challenge involves. Can you find the shortest path through a simple rectangular maze?

Problem Description

You will be provided with some rectangular mazes and will have to write a program to read the maze diagram, then determine the shortest path through the maze, and report how many "cells" were traversed to move from entrance to exit. Moves are only made horizontally and vertically, and of course may not be made through walls.

Each "cell" within the maze is represented as a 3-by-4 horizontal rectangle of characters, bounded on each corner by a plus sign (+). Each cell shares its edges with its neighbors; that is, the right edge of one cell is also the left edge of the next cell. Dashes (-) and pipes (|) are used between the plus signs to indicate if a cell's edge contains an impassible wall; otherwise, these characters will be spaces, indicating an open space you can pass through. The center of each cell will always contain two spaces. See the example cells below:

<pre>+--+--+
| | |
+--+--+</pre>
	<pre>+--+
	   |
	+ +</pre>

Two fully closed cells, with walls on all sides	A cell with the left and bottom edges open

Each maze will have one entrance and one exit, which will both appear along an outer edge of the maze (and may be located on the same side). They will be represented by replacing a cell's edge with one of the following sets of characters:

- Two lowercase letter v's will replace dashes to represent an entrance along the maze's top edge, and/or an exit along the maze's bottom edge.
- Two carets (^^) will replace dashes to represent an entrance along the maze's bottom edge, and/or an exit along the maze's top edge.
- A right angle bracket (>) will replace a pipe to represent an entrance along the maze's left edge, and/or an exit along the maze's right edge.
- A left angle bracket (<) will replace a pipe to represent an entrance along the maze's right edge, and/or an exit along the maze's left edge.

Each maze may have more than one viable path from the entrance to the exit; again, your goal is to find the shortest path, and report how many cells you had to step through along the way.

Sample Input

The first line of your program's input, received from the standard input channel, will contain a positive integer representing the number of test cases. Each test case will include:

- A line containing two positive integers, separated by a space, representing the height of the maze diagram in lines, H, and its width in printed characters, W, respectively.
- H lines, each W characters long, representing the maze diagram. These lines may contain dashes (-), plus signs (+), pipes (|), spaces, carets (^), lowercase letter v's, and/or angle brackets (> or <), as described above.

To avoid breaking across multiple pages, the sample input is provided on the next page.

```
2
11 16
+vv+--+--+--+--+
|        |     |
+--+  +--+  +--+
|  |     |     |
+  +--+  +--+  +
|              |
+  +--+--+  +--+
|     |        |
+--+  +  +--+  +
|           |  >
+--+--+--+--+--+
11 31
+--+--+--+--+--+--+--+--+--+--+
<        |     |     |     |  |
+--+  +--+  +--+  +  +  +  +  +
|  |     |        |     |     |
+  +--+  +  +--+--+--+--+--+  +
|  |        |     |           |
+  +--+--+--+  +  +  +--+  +--+
|     |        |     |        |
+--+  +  +--+--+  +--+  +--+  +
>           |     |     |     |
+--+--+--+--+--+--+--+--+--+--+
```

Sample Output

For each test case, your program must print the number of cells traversed when moving from entrance to exit.

```
9
31
```