6797 Chuck's Challenge

Chuck's Challenge is a game in which a player navigates a maze consisting of various tiles in a grid. The player can encounter doors that may be unlocked using keys they acquire along the way. You must write a program to determine the minimum number of doors that must be opened to reach the exit of the maze.

Key

Tile	Meaning	Passable
`>`	Entrance	Yes
`<`	Exit	Yes
`a-z`	Key	Yes
`A-Z`	Door	See rules
`.`	Ground	Yes
`+`	Wall	No
`~`	Unstable floor	See rules

Rules

- Tiles that are diagonal to each other are not considered to be adjacent (only up, down, left, and right).
- The player begins the maze visiting the entrance tile.
- The player may only visit passable tiles that are adjacent to the tile the player is currently visiting.
- Doors are considered impassable until a tile with a matching key ('`A`' matches '`a`', '`B`' matches '`b`', etc.) has been visited.
- At first, unstable floors are considered passable; however, if the player leaves an unstable floor and visits any other type of tile, it becomes impassable.
- When an unstable floor tile becomes impassable, all adjacent unstable floor tiles become impassable.
- The external edge of the maze is an impassable wall.

Input

The first line of input will contain the number of test cases, T ($1 \leq T \leq 50$). Each test case will begin with a line containing two integers R C ($4 \leq R, C \leq 50$). Following that will be a maze with R rows and C columns. Only the characters in the key will be present in the maze.

Output

Each test case will have a single line of output. Print the minimum number of doors that must be opened to reach the exit or print '`Impossible`' if the exit cannot be reached.

Sample Input

```
2
8 15
+++++++++++++++
+>.............+
+...a...+~+~+B+
+~+++++++~+~+.+
+~++..b..C+~+.+
+~++A++++++~+.+
+....~~~~~~c+<+
+++++++++++++++
8 6
++++++
+>.A<+
+.++++
+.+.a+
+~~..+
+~~..+
+~~..+
++++++
```

Sample Output

```
2
Impossible
```