3. Milk Tea Trip

Problem ID: 9749 | Required Problem | 100pt(s)

Time Limit: 1000ms **Memory Limit: 524288kB**

Description

On a summer vacation day, Yudada and his friend Hongdada agreed to play at Hongdada's house. When Yudada was about to leave, Hongdada suddenly asked Yudada to buy a cup of milk tea on the way. Yudada would choose to help, but in order to save time and play with Hongdada as soon as possible, Yudada would order the milk tea online first, then go to the milk tea shop in the shortest time, take the milk tea, and then arrive at Hongdada's house. How much time does Yudada need to reach Hongdada's house at least?

Input

The first line contains two integers n and m. The following n lines, each line input m characters to represent the map. 2 ≤n,m ≤100. “Y” represents the home of Yudada. “H” represents the home of Hongdada. “Q” represents the milk tea shop. “#” is an obstacle. '.', 'Y', 'H' and 'Q', these positions can be passed through.

Output

Output the minimum time for Yudada to arrive at Hongdada's house. If it is impossible to buy milk tea and arrive, output “no way”

Examples

Input 1

```
8 10
#.##.Q.#.#
.#.#..###.
..#...#..#
.###......
#..Y..##.#
..#...#.#.
#.##.#####
.##.H..##.
```

Output 1

```
14
```

Input 2

```
8 10
#.##...#Q#
.#.#..###.
..#...#..#
.###......
#..Y..##.#
..#...#.#.
#.##.#####
.##.H..##.
```

Output 2

```
no way
```

Examples Explanation

Sample1: Yudada first starts from Y, takes the shortest route to Q, costs 6 minutes, takes the milk tea, then starts from Q, takes the shortest route to H, costs 8 minutes. Sample2: Yudada first starts from Y, can't walk to the milk tea shop Q, output no way

Constraint

2 ≤n,m ≤100