

Problem 3279: Maximum Total Area Occupied by Pistons

Problem Information

Difficulty: Hard

Acceptance Rate: 38.60%

Paid Only: Yes

Tags: Array, Hash Table, String, Simulation, Counting, Prefix Sum

Problem Description

There are several pistons in an old car engine, and we want to calculate the **maximum** possible area **under** the pistons.

You are given:

- * An integer `height`, representing the **maximum** height a piston can reach.
- * An integer array `positions`, where `positions[i]` is the current position of piston `i`, which is equal to the current area **under** it.
- * A string `directions`, where `directions[i]` is the current moving direction of piston `i`, 'U' for up, and 'D' for down.

Each second:

- * Every piston moves in its current direction 1 unit. e.g., if the direction is up, `positions[i]` is incremented by 1.
- * If a piston has reached one of the ends, i.e., `positions[i] == 0` or `positions[i] == height`, its direction will change.

Return the _maximum possible area_ under all the pistons.

Example 1:

Input: height = 5, positions = [2,5], directions = "UD"

Output: 7

****Explanation:****

The current position of the pistons has the maximum possible area under it.

****Example 2:****

****Input:**** height = 6, positions = [0,0,6,3], directions = "UUDU"

****Output:**** 15

****Explanation:****

After 3 seconds, the pistons will be in positions `[3, 3, 3, 6]` , which has the maximum possible area under it.

****Constraints:****

* `1 <= height <= 106` * `1 <= positions.length == directions.length <= 105` * `0 <= positions[i] <= height` * `directions[i]` is either `'U` or `'D`.

Code Snippets

C++:

```
class Solution {
public:
    long long maxArea(int height, vector<int>& positions, string directions) {
        }
};
```

Java:

```
class Solution {
public long maxArea(int height, int[] positions, String directions) {
        }
}
```

Python3:

```
class Solution:  
    def maxArea(self, height: int, positions: List[int], directions: str) -> int:
```