

# 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:
```