3279. Maximum Total Area Occupied by Pistons Premium

Hard Topics Hint

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 <= 10^6`
- `1 <= positions.length == directions.length <= 10^5`
- `0 <= positions[i] <= height`
- `directions[i]` is either `'U'` or `'D'`.

Seen this question in a real interview before? 1/5

Yes No

Accepted 260 | Submissions 465 | Acceptance Rate 55.9%

Topics

Array Hash Table String Simulation Counting Prefix Sum

Hint 1

Simulate the process.

Hint 2

We only need to keep track of the times when a piston reaches one end and let's call these critical points.

Hint 3

For each piston, find the first time it reaches one end and sort these times (these times are critical points).

Hint 4

Find a way to calculate the area difference between two consecutive critical points in constant time.

Discussion (0)