Problem 1872: Stone Game VIII

Problem Information

Difficulty: Hard
Acceptance Rate: 53.71%
Paid Only: No
Tags: Array, Math, Dynamic Programming, Prefix Sum, Game Theory

Problem Description

Alice and Bob take turns playing a game, with **Alice starting first**.

There are `n` stones arranged in a row. On each player's turn, while the number of stones is **more than one** , they will do the following:

1. Choose an integer `x > 1`, and **remove** the leftmost `x` stones from the row. 2. Add the **sum** of the **removed** stones' values to the player's score. 3. Place a **new stone** , whose value is equal to that sum, on the left side of the row.

The game stops when **only** **one** stone is left in the row.

The **score difference** between Alice and Bob is `(Alice's score - Bob's score)`. Alice's goal is to **maximize** the score difference, and Bob's goal is the **minimize** the score difference.

Given an integer array `stones` of length `n` where `stones[i]` represents the value of the `ith` stone **from the left** , return _the**score difference** between Alice and Bob if they both play **optimally**._

Example 1:

Input: stones = [-1,2,-3,4,-5] **Output:** 5 **Explanation:** - Alice removes the first 4 stones, adds (-1) + 2 + (-3) + 4 = 2 to her score, and places a stone of value 2 on the left. stones = [2,-5]. - Bob removes the first 2 stones, adds 2 + (-5) = -3 to his score, and places a stone of value -3 on the left. stones = [-3]. The difference between their scores is 2 - (-3) = 5.

Example 2:

Input: stones = [7,-6,5,10,5,-2,-6] **Output:** 13 **Explanation:** - Alice removes all stones, adds 7 + (-6) + 5 + 10 + 5 + (-2) + (-6) = 13 to her score, and places a stone of value 13 on the left. stones = [13]. The difference between their scores is 13 - 0 = 13.

Example 3:

Input: stones = [-10,-12] **Output:** -22 **Explanation:** - Alice can only make one move, which is to remove both stones. She adds (-10) + (-12) = -22 to her score and places a stone of value -22 on the left. stones = [-22]. The difference between their scores is (-22) - 0 = -22.

Constraints:

* `n == stones.length` * `2 <= n <= 105` * `-104 <= stones[i] <= 104`

Code Snippets

C++:

```
class Solution {
public:
int stoneGameVIII(vector<int>& stones) {


}
};
```

Java:

```
class Solution {
public int stoneGameVIII(int[] stones) {


}
}
```

Python3:

```
class Solution:
def stoneGameVIII(self, stones: List[int]) -> int:
```