Problem 1927: Sum Game

Problem Information

Difficulty: Medium
Acceptance Rate: 49.20%
Paid Only: No
Tags: Math, String, Greedy, Game Theory

Problem Description

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

You are given a string `num` of **even length** consisting of digits and `'?'` characters. On each turn, a player will do the following if there is still at least one `'?'` in `num`:

1. Choose an index `i` where `num[i] == '?'`. 2. Replace `num[i]` with any digit between `'0'` and `'9'`.

The game ends when there are no more `'?'` characters in `num`.

For Bob to win, the sum of the digits in the first half of `num` must be **equal** to the sum of the digits in the second half. For Alice to win, the sums must **not be equal**.

* For example, if the game ended with `num = "243801"`, then Bob wins because `2+4+3 = 8+0+1`. If the game ended with `num = "243803"`, then Alice wins because `2+4+3 != 8+0+3`.

Assuming Alice and Bob play **optimally** , return `true` _if Alice will win and_`false` _if Bob will win_.

Example 1:

Input: num = "5023" **Output:** false **Explanation:** There are no moves to be made. The sum of the first half is equal to the sum of the second half: 5 + 0 = 2 + 3.

Example 2:

Input: num = "25??" **Output:** true **Explanation:** Alice can replace one of the '?'s with '9' and it will be impossible for Bob to make the sums equal.

Example 3:

Input: num = "?3295???" **Output:** false **Explanation:** It can be proven that Bob will always win. One possible outcome is: - Alice replaces the first '?' with '9'. num = "93295???". - Bob replaces one of the '?' in the right half with '9'. num = "932959??". - Alice replaces one of the '?' in the right half with '2'. num = "9329592?". - Bob replaces the last '?' in the right half with '7'. num = "93295927". Bob wins because 9 + 3 + 2 + 9 = 5 + 9 + 2 + 7.

Constraints:

* `2 <= num.length <= 105` * `num.length` is **even**. * `num` consists of only digits and `'?'`.

Code Snippets

C++:

```
class Solution {
public:
bool sumGame(string num) {

}
};
```

Java:

```
class Solution {
public boolean sumGame(String num) {

}
}
```

Python3:

```
class Solution:
def sumGame(self, num: str) -> bool:
```