

Problem 3630: Partition Array for Maximum XOR and AND

Problem Information

Difficulty: Hard

Acceptance Rate: 13.48%

Paid Only: No

Tags: Array, Math, Greedy, Bit Manipulation, Enumeration

Problem Description

You are given an integer array `nums`.

Partition the array into **three** (possibly empty) subsequences `A`, `B`, and `C` such that every element of `nums` belongs to **exactly** one subsequence.

Your goal is to **maximize** the value of: `XOR(A) + AND(B) + XOR(C)`

where:

* `XOR(arr)` denotes the bitwise XOR of all elements in `arr`. If `arr` is empty, its value is defined as 0.
* `AND(arr)` denotes the bitwise AND of all elements in `arr`. If `arr` is empty, its value is defined as 0.

Return the **maximum** value achievable.

Note: If multiple partitions result in the same **maximum** sum, you can consider any one of them.

Example 1:

Input: nums = [2,3]

Output: 5

****Explanation:****

One optimal partition is:

`* `A = [3], XOR(A) = 3` * `B = [2], AND(B) = 2` * `C = [], XOR(C) = 0``

The maximum value of: $\text{`XOR(A) + AND(B) + XOR(C) = 3 + 2 + 0 = 5'}$. Thus, the answer is 5.

****Example 2:****

****Input:**** `nums = [1,3,2]`

****Output:**** 6

****Explanation:****

One optimal partition is:

`* `A = [1], XOR(A) = 1` * `B = [2], AND(B) = 2` * `C = [3], XOR(C) = 3``

The maximum value of: $\text{`XOR(A) + AND(B) + XOR(C) = 1 + 2 + 3 = 6'}$. Thus, the answer is 6.

****Example 3:****

****Input:**** `nums = [2,3,6,7]`

****Output:**** 15

****Explanation:****

One optimal partition is:

`* `A = [7], XOR(A) = 7` * `B = [2,3], AND(B) = 2` * `C = [6], XOR(C) = 6``

The maximum value of: $\text{`XOR(A) + AND(B) + XOR(C) = 7 + 2 + 6 = 15'}$. Thus, the answer is 15.

****Constraints:****

```
* `1 <= nums.length <= 19` * `1 <= nums[i] <= 109`
```

Code Snippets

C++:

```
class Solution {  
public:  
    long long maximizeXorAndXor(vector<int>& nums) {  
  
    }  
};
```

Java:

```
class Solution {  
public long maximizeXorAndXor(int[] nums) {  
  
}  
}
```

Python3:

```
class Solution:  
    def maximizeXorAndXor(self, nums: List[int]) -> int:
```