

2291. Maximum AND Sum of Array

Difficulty : Hard

<https://leetcode.com/problems/maximum-and-sum-of-array>

You are given an integer array `nums` of length `n` and an integer `numSlots` such that $2 * \text{numSlots} \geq n$. There are `numSlots` slots numbered from 1 to `numSlots`.

You have to place all `n` integers into the slots such that each slot contains at **most** two numbers. The **AND sum** of a given placement is the sum of the **bitwise AND** of every number with its respective slot number.

- For example, the **AND sum** of placing the numbers `[1, 3]` into slot `1` and `[4, 6]` into slot `2` is equal to $(1 \text{ AND } 1) + (3 \text{ AND } 1) + (4 \text{ AND } 2) + (6 \text{ AND } 2) = 1 + 1 + 0 + 2 = 4$.

Return the maximum possible **AND sum** of `nums` given `numSlots` slots.

Example 1:

Input: `nums = [1,2,3,4,5,6]`, `numSlots = 3`

Output: 9

Explanation: One possible placement is `[1, 4]` into slot `1`, `[2, 6]` into slot `2`, and `[3, 5]` into slot `3`.

This gives the maximum AND sum of $(1 \text{ AND } 1) + (4 \text{ AND } 1) + (2 \text{ AND } 2) + (6 \text{ AND } 2) + (3 \text{ AND } 3) + (5 \text{ AND } 3) = 1 + 0 + 2 + 2 + 3 + 1 = 9$.

Example 2:

Input: `nums = [1,3,10,4,7,1]`, `numSlots = 9`

Output: 24

Explanation: One possible placement is `[1, 1]` into slot `1`, `[3]` into slot `3`, `[4]` into slot `4`, `[7]` into slot `7`, and `[10]` into slot `9`.

This gives the maximum AND sum of $(1 \text{ AND } 1) + (1 \text{ AND } 1) + (3 \text{ AND } 3) + (4 \text{ AND } 4) + (7 \text{ AND } 7) + (10 \text{ AND } 9) = 1 + 1 + 3 + 4 + 7 + 8 = 24$.

Note that slots 2, 5, 6, and 8 are empty which is permitted.

Constraints:

- $n == \text{nums.length}$
- $1 \leq \text{numSlots} \leq 9$
- $1 \leq n \leq 2 * \text{numSlots}$
- $1 \leq \text{nums}[i] \leq 15$