

Problem 3671: Sum of Beautiful Subsequences

Problem Information

Difficulty: Hard

Acceptance Rate: 21.57%

Paid Only: No

Tags: Array, Math, Tree, Number Theory

Problem Description

You are given an integer array `nums` of length `n`.

For every **positive** integer `g`, we define the **beauty** of `g` as the **product** of `g` and the number of **strictly increasing** **subsequences** of `nums` whose greatest common divisor (GCD) is exactly `g` .

Return the **sum** of **beauty** values for all positive integers `g` .

Since the answer could be very large, return it modulo `109 + 7` .

Example 1:

Input: nums = [1,2,3]

Output: 10

Explanation:

All strictly increasing subsequences and their GCDs are:

Subsequence | GCD ---|--- [1] | 1 [2] | 2 [3] | 3 [1,2] | 1 [1,3] | 1 [2,3] | 1 [1,2,3] | 1
Calculating beauty for each GCD:

GCD | Count of subsequences | Beauty (GCD × Count) ---|--- 1 | 5 | 1 × 5 = 5 2 | 1 | 2 × 1 = 2 3 | 1 | 3 × 1 = 3 Total beauty is `5 + 2 + 3 = 10` .

****Example 2:****

****Input:**** nums = [4,6]

****Output:**** 12

****Explanation:****

All strictly increasing subsequences and their GCDs are:

Subsequence | GCD ---|--- [4] | 4 [6] | 6 [4,6] | 2 Calculating beauty for each GCD:

GCD | Count of subsequences | Beauty (GCD × Count) ---|--- 2 | 1 | $2 \times 1 = 2$ 4 | 1 | $4 \times 1 = 4$ 6 | 1 | $6 \times 1 = 6$ Total beauty is ` $2 + 4 + 6 = 12$ `.

****Constraints:****

* `1 <= n == nums.length <= 104` * `1 <= nums[i] <= 7` * `104`

Code Snippets

C++:

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

Java:

```
class Solution {
public int totalBeauty(int[] nums) {
        }
    };
}
```

Python3:

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