

Codeforces Round 911 Problem D - **Small GCD**

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Given

- . Given Array A of element of size n
- . **Constraint**

$$3 \leq n \leq 8e^4$$
$$1 \leq A[i] \leq 1e^5$$

Compute

$$\sum_{i=1}^n \sum_{j=i+1}^n \sum_{k=j+1}^n f(A[i], A[j], A[k])$$

Function $f(A[i], A[j], A[k]) := GCD(A[i], A[j], A[k] - \max(A[i], A[j], A[k]))$

Let Sort the Array

$$A[1], A[2], A[3], \dots, A[t], \dots, A[n]$$

Let the $A[t]$ be j the index and let the k th index be $k > j$

The i th index be $i < j$

$$ans = \sum_{j=2}^n \sum_{i=1}^{j-1} gcd(A[j], A[i]) * (n - j)$$

Let $dp[val]$ denote the count of triplets in array A such that:

$$A[i] \% val == 0 \quad \text{and} \quad A[j] \% i == 0 \quad A[k] \quad \text{where} \quad i < j < k$$

On Computing Values of dp for all the val

Aim - To get the number of triplet with GCD g

dp1[val] Number of triplets with gcd equal to val

To compute

$$\sum_{val=1}^{val=MAX} dp1[val] * val$$

According to the above Constraint $MAX = 1e^5$

$$dp[MAX] = dp1[MAX]dp1[val] = dp[val] - \sum_{i=2}^{i=\lfloor \frac{MAX}{val} \rfloor} dp1[val * i]$$

$$ans = \sum_{i=1}^{i=MAX} dp1[i] * i$$