Roadies Tutorial

Pre-requisites:

This problem will require concepts of gcd, divisibility and segment trees to solve. Make sure your basics of gcd, euclidean algorithm, number theory and segment trees are clear before attempting this problem. The following links can help you learn the prerequisites:

- https://www.topcoder.com/community/data-science/data-science-tutorials/prime-numbers-factorization-and-euler-function/
- https://www.topcoder.com/community/data-science/data-science-tutorials/mathematics-for-topcoders/
- http://www.geeksforgeeks.org/basic-and-extended-euclidean-algorithms/
- http://www.virtualnerd.com/pre-algebra/factors-fractions-exponents/prime-factorization-greatest-common-factor/greatest-common-factor/greatest-common-factor-two-numbers
- https://www.hackerearth.com/practice/math/number-theory/basic-number-theory-1/tutorial/
- https://www.topcoder.com/community/data-science/data-science-tutorials/range-minimum-query-and-lowest-common-ancestor/
- http://codeforces.com/blog/entry/3327
- https://www.hackerearth.com/practice/notes/segment-tree-and-lazy-propagation/

Problem Description:

There are n participants, each with a specific strength s_i, they are supposed to compete with each other and some of them have to be eliminated. The way this will occur is that they all stand in a specific order and for a given left and a right index, each pair of them fights each other. When two participants i and j fight, i gets a battle point if s_i divides s_j and vice-versa. All participants whose sum of battle points is not equal to l-r (where l and r were the left and right indices respectively) gets disqualified. We have to find out the number of disqualified participants.

Difficulty Level:

Hard

Editorial:

Let us begin by understanding how we got the given sample output from the given sample input. In the first example, the first test battle points for each participant are v = [4, 0, 2, 0, 2]. So, participant number 1 is qualified and participant numbers 2, 3, 4, 5 are disqualified. In the second example, the first test battle points for each participant are v = [0, 2, 0, 2]. So, all participants are disqualified. In the third example, the first test battle points for each participant are v = [2, 0, 2]. So, participant number 3 and 5 are qualified and participant number 4 is disqualified. In the fourth example, the first test battle points for each participant are v = [0, 1]. So, participant number 5 is qualified participant number 4 is disqualified.

For each subsequence [L, R] we must find how many values we have which are the GCD of (s_L, s_{L+1}, ..., s_R). Also, we must notice that the GCD of (s_L, s_{L+1}, ..., s_R) can be only the minimum value from (s_L, s_{L+1}, ..., s_R). So for each query we search in a segment tree (or a RMQ) the minimum value and the GCD of (s_L, s_{L+1}, ..., s_R) and if these two values are equal then we output the answer $R - L + 1 - nrValues$, where *nrValues* is the number of values in the subsequence equal to the GCD and the minimum value.

Complexity of solution:

The complexity of this solution is $O(n \cdot log(n) \cdot log(valMax) + t \cdot log(n) \cdot log(valMax))$, where *valMax* is the maximum value of s_i, the strengths of the participants.