

Problem 2: Enigmatic Evan - Solution

Firstly, observe that since vectors commute, only the number of letters is important. Let us say S is the set that contains how often a letter occurs. Since we can choose each dimension of a letter vector independently, we can treat each dimension of the problem separately. Only if we can reach the target in each dimension do we print Y. Let us write $I = \langle S \rangle$ for the set of integer linear combinations of the numbers in S . Since I is a subgroup of \mathbb{Z} , we must have $I = k\mathbb{Z}$. So, k is the smallest number that can be reached through linear combinations of S . That is precisely the gcd. So, we see that a coordinate can be reached if and only if it is a multiple of $\gcd(S)$.