Problem C: Jumbled String

Thought process

The number of "00" substrings in a string with n zeros is $nC2 = \frac{n(n-1)}{2}$, and this is also true for the number of "11" substrings in a string with n ones.

From the inputs a and d, and by rearranging the above, the number of zeroes in the string z can be calculated by solving $z^2 - z - 2a = 0$ and the number of ones in the string y can be calculated by solving $y^2 - y - 2d = 0$ with the quadratic formula in $O(1)$ time. If there is no positive integer solution then it is impossible.

From there, I first thought about what happens as we insert 1s between the 0s, but such a heuristic would be tricky to implement. However, I did find a pattern for how the position of inserting the 1s changed the current number of "01" and "10" substrings, and also discovered a way to check if such a string is possible (for a string with x zeros and y ones, if $b + c \neq xy$ then it is impossible).

While the above would be tricky to implement, I changed the approach to revolve around starting with all the 0s, then all the 1s at the rightmost positions (e.g., 00000111), and then moving the 1s to the left. Moving a 1 to the left, from after the jth zero to after the ith zero, decreases b and increases c by the number of zeroes it was moved past.

Challenges

The approach above did not correctly handle edge cases such as $a = 1,\ b = c = d = 0$ where the correct answer is "00" but my approach output "impossible".