

Exchange Argument for Question 1.

Lets assume that there is an optimal solution O to this greedy problem and lets assume A is the algorithm that we selected.

So lets suppose that the red sticks have (r_1, r_2) where $r_1 < r_2$, and blue sticks have (b_1, b_2) where $b_1 < b_2$. And lets suppose A pairs up r_1, b_1 and r_2, b_2 while O pairs r_1, b_2 and r_2, b_1 . If according to the optimal solution, r_1 and b_2 has minimum difference, this may mean that r_2 and b_1 has larger difference. By summing up the differences, the difference would be greater or equal than the difference calculated by A . So as this approach would make O suffer, O would be close to A if it produces optimal answer. Therefore, A produces the optimal answer for this problem.