

CPSC 413: Exercise Set 6

1. Suppose a divide and conquer algorithm divides the input into q pieces of size $\frac{n}{b}$ each, while the splitting and recombining time is given by $f(n)$. Determine the running time $T(n)$ of the algorithm if:
 - $q = 5, b = 5, f(n) = O(n)$;
 - $q = 1, b = 4, f(n) = O(1)$ (constant time);
 - $q = 2, b = 2, f(n) = O(n^3)$.
2. In class, we talked about counting the number of inversions in a sequence a_1, a_2, \dots, a_n , where an inversion is a pair $i < j$ but $a_i > a_j$. Suppose instead we only wanted to count something as an inversion if $i < j$ but $a_i \geq 3a_j$. Give a $O(n \log n)$ algorithm that computes the number of these inversions.