Task-4

The function dvd_nd_cnqr recursively takes a list of integers data and an optional arguement max_v. It returns a tuple containing two values : a list of integers and the maximum value of the expression $a[i] + b[j]^2$. If the length of the input list is 1, return the list and -inf as the maximum value. If the length of the input list is 2, calculate the value of the expression for these two elements and return the list and this value as the maximum value. Otherwise, divide the input list into two halves and recursively call dvd_nd_cnqr on each half. Merge the two sorted lists returned by each recursive call into a single sorted list, while calculating the maximum value of expression.

The time complexity of this algorithm can be expressed as $T(n) = 2T(n/2) + O(n)$, where n is the length of the input list. By solving it using the master theorem, the time complexity is $O(n \log n)$ for this algorithm.