

1. Derive the formula for worst-case complexity.

Quicksort is a recursive algorithm that continues to partition the array until each partition has one or no elements, so for the worst-case complexity the recursion relation will be

$$T(n) = T(n-1) + n$$

$$T(n) = T(n-2) + (n-1) + n$$

If the recursion is done by k times then,

$$T(n) = T(n-k) + kn - (k(k-1))/2$$

Then we put $k = N$ in the above equation, then

$$T(N) = T(0) + N \cdot N - (N(N-1))/2$$

$$= N^2 - (N(N-1))/2$$

$$= N^2/2 + N/2$$

Therefore, the worst-case complexity for the Quicksort is $O(N^2)$.

3 / 4

