M2 – Algorithms and Data Structures

5 Divide-and-Conquer

5.2 Quicksort

1. divide the array by a center position (HoarePartition);
2. during the partition it also sorts the array

Unlike mergesort, which divides its input elements according to their position in the array, quicksort divides them according to their **value**

A partition is an arrangement of the array's elements so that all the elements to the left of some element **A[s]** are less than or equal to A[s], and all the elements to the right of A[s] are greater than or equal to it

the entire work happens in the division stage, with no work required to combine the solutions to the subproblems.

quicksort's efficiency:

If all the splits happen in the middle of corresponding subarrays, we will have the best case.
Cbest(n) ∈ Θ(n log2 n);

In the worst case, all the splits will be skewed to the extreme: one of the two subarrays will be empty, and the size of the other will be just 1 less than the size of the subarray being partitioned.
Cworst(n) ∈ Θ(n^2).

Cavg(n) ≈ 2n ln n ≈ 1.39n log2 n.