

Definitions:

In-place Sorting Algorithm: A sorting algorithm which takes very little additional memory. Typically, less than linear memory.

In-Place Algorithm In General: Slightly different meanings depending on who is using it. Typically means, transform input using no auxiliary structure.

- Strictest form, algorithm can only have a constant amount of extra space.

Stable Sorting Algorithm: If two objects with equal keys appear in the same order in sorted output as they appear in the input array.

Divide and Conquer Algorithm: An algorithm that is based on multi-branched recursion. These types of algorithms work by recursively breaking down a problem into two or more sub-problems of the same or similar type, until these become simple enough to be solved directly.

- Used in
 - Sorting
 - Quick Sort
 - Merge Sort
 - Multiplying Large Numbers
 - Finding Closest Pair of Points
 - Syntactic Analysis (Top Down Parsers)
- Often correctness is proved by mathematical induction
- Computation cost determined by solving recurrence relations

Locality of Reference:

- Temporal Locality
 - One particular memory location is referenced, likely to be referenced again in near future.
 - Special case of spatial locality
 - Prospective location identical to present location
- Spatial Locality
 - Particular storage location is referenced at particular time, likely that nearby memory locations will be referenced in near future.
 - Common to guess shape and size.
 - Why ArrayList faster than LinkedList.

Logarithm: A logarithm is the power to which a number must be raised in order to get some other number.

$$\log(100) = 2 \text{ because } 10^x = 100 \mid x = 2$$

$$\log_2(4) = 2 \text{ because } 2^x = 4 \mid x = 2$$

... more generally ...

$$\text{To Solve } \log_n(x) \text{ do } n^{\text{To What Number}} = x$$

Natural Logarithm: A logarithm with the base being e

Comparison Based Sort: All decisions based on comparing keys ("if statements")