**Insertion Sort**

*(Dumb - "Inserting" elements met along the way to sorted portion)*

**A picture containing font, text, white, black and white

Description automatically generated**Time complexity:

* Worst case O(n2)
* Average case O(n2)
* Best case O(n) (already sorted)

Space complexity: O(1)

**Selection Sort**

*Traverse full list to find smallest element, next smallest, etc.*

*A picture containing text, screenshot, font, design

Description automatically generated*

Time complexity:

* Worst case O(n2)
* Average case O(n2)
* Best case O(n2)

Space complexity: O(1)

**Bubble Sort**

*("bubble" each one into its right position)*

* Compare every 2 consecutive numbers. Swap if needed.
* After each iteration of the whole list, the largest element will be in correct place

A picture containing symbol, font, logo, graphics

Description automatically generatedTime complexity:

* Worst case O(n2)
* Average case O(n2)
* Best case O(n) (already sorted)

Space complexity: O(1)

**Merge Sort**

*Divide and conquer*

* Split the original list into multiple lists of size a.
* Each step: Merge each 2 lists size a together to form lists of size a\*2. Compare elements between the 2 lists while merging.
  + Comparision should be done by seeing which element from either list should be inserted to the merged list first.
  + Each list is always sorted
  + If a list is empty before the other one, simply move all elements of the other list to the back (larger)

A picture containing font, text, white, handwriting

Description automatically generatedTime complexity: *num\_comparisions\_per\_steps (<= n) \* num\_steps (log(n))*

* Worst case O(nlog(n))
* Average case O(nlog(n))
* Best case O(nlog(n))

Space complexity: O(n)

**Quick Sort**

*(select and suffle - pick pivot and move left/right, quick sort left, quick sort right)*

Select and suffle:

Shape

Description automatically generated

Time complexity:

* Worst case O(n2) (always pick smallest pivot)
* Average case O(nlog(n))
* Best case O(nlog(n)) (pick median pivot)