chapter 8 Sorting

- simplest are $O(N^2)$

insertion Sort N^2

- like cards

2 3 4 find i insert

worst case → shift through all

Sort 8,7,6 to increasing

best case

Sort 6,7,8 to increasing

insertion sort

not sorted duplicate algorithm → N^2

Sorted duplicate → N

inversion → pair of elements out of order

Theorem 8.1 : Average # inversions $N(N-1)/4$

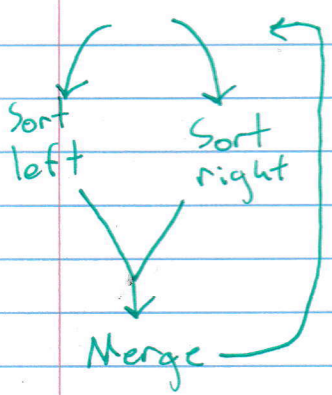
To do better than N^2 you must swap more than 1 inversion at a time.

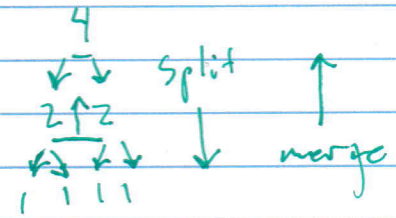
Shell Sort $N \log N$

- start with a bigger gap
- slowly bring the gap down by 2.2

Merge Sort $N \log N$ "broken in two"

- recursive





Chapter 8 - Quick Sort

Pick item

< = > groups

sort

worst N^2 Best $N \log N$

base #1 return 1 or 0

#2 pick pivot

return Quicksort L

Quicksort R

- Choosing bad pivot can lead to issues
- partitioning is faster than merging

How to pick pivot:

- not first
- middle
- median of
  - first
  - mid
  - last

Quick Select Find k^{th} smallest element

#1 pivot

#2 sort smaller

#3 Quickselect