

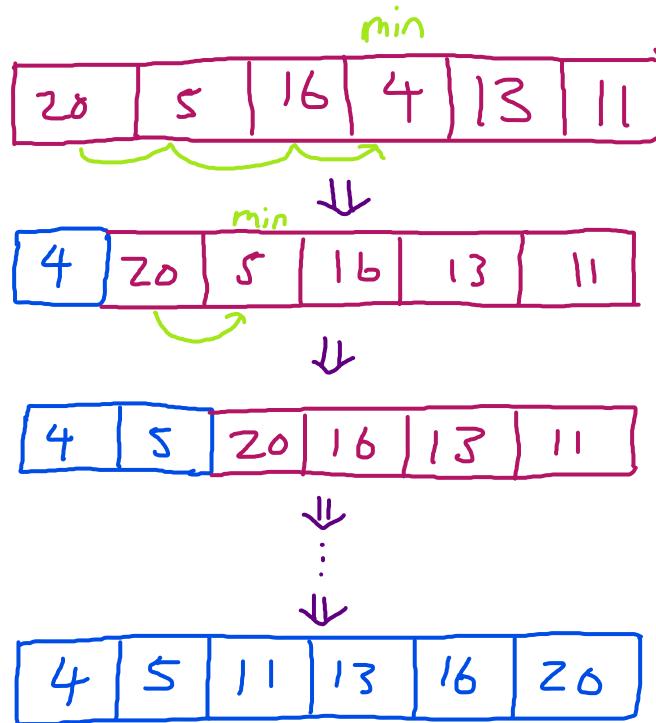
# Sorting



## Selection Sort

- ① Find smallest item by traversing array
- ② Swap this item to front of "unfixed" items and "fix" it
- ③ Repeat 1 and 2 for unfixed items until all items are "fixed"

Example:



## Selection Sort Runtime? $\Theta(N^2)$

We traverse the array to find the minimum. This will take  $\Theta(N)$ . We repeat this  $N$  times. Therefore, our runtime is  $\Theta(N^2)$ .

stable? (equal items in unsorted array remain in same sequence)  
i.e.  $[4_{(1)}, 5, 4_{(2)}] \rightarrow [4_{(1)}, 4_{(2)}, 5]$

## Insertion Sort

Repeat for  $i=0, 1, \dots, N-1$ :

Swap item  $i$  backwards until it is in right place among previously examined items

Example:

$i=0$

32	15	16	14	19	26	11	17	17
----	----	----	----	----	----	----	----	----

$i$



$i=1$

32	15	16	14	19	26	41	17	17
----	----	----	----	----	----	----	----	----

$i$



swap at index  $i$  and index of smallest item larger than item  $i$

$i=2$

15	32	16	14	19	26	41	17	17
----	----	----	----	----	----	----	----	----

$i$



$i=3$

15	16	32	14	19	26	41	17	17
----	----	----	----	----	----	----	----	----

$i$



$i=4$

14	15	16	32	19	26	41	17	17
----	----	----	----	----	----	----	----	----

$i$



⋮



14	15	16	17	17	19	26	41
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