

Selection Example

Goal: to pick the 20th
number from 45

Input: 45 random numbers:

99	11	41	82	25	37	11	84	98
70	78	15	13	70	10	49	29	8
35	18	99	70	77	76	81	38	14
82	29	97	77	31	54	49	11	65
22	64	79	17	77	4	89	30	58

Split the 45 into groups of 5 and sort each individually using **Insertionsort**.

Median of each set is in **red**.

22	11	15	13	25	4	11	11	8
35	18	41	17	31	10	49	29	14
70	29	79	70	70	37	49	30	58
82	64	97	77	77	54	81	38	65
99	78	99	82	77	76	89	84	98

Recursively run **selection** to find that median of medians is **58**.

(Implicitly) rearrange groups so those with median < 58 are left of center; those with median > 58 are right of center.

Notice that everything above-left of 58 is smaller than 58 and everything below-right of 58 is larger than 58.

11	11	4	11	8	22	25	13	15
18	29	10	49	14	35	31	17	41
29	30	37	49	58	70	70	70	79
64	38	54	81	65	82	77	77	97
78	84	76	89	98	99	77	82	99

11	11	4	11	8	22	25	13	15
18	29	10	49	14	35	31	17	41
29	30	37	49	58	70	70	70	79
64	38	54	81	65	82	77	77	97
78	84	76	89	98	99	77	82	99

Run **partition** on full set using 58 as pivot. Find that 58 is 25th number in set.

To find 20th in full set it's enough to find 20th in set of first 24 items (which we know from **partition**).

All numbers < 58 :

11	30	54	14	31
18	38	11	41	13
29	4	49	22	17
11	10	49	35	15
29	37	8	25	

Sort in groups of 5 numbers

11	4	8	14	
11	10	11	22	13
18	30	49	25	15
29	37	49	35	17
29	38	54	41	31

Recursively run **selection** to find median of medians = **25**.

11		14	4	8
11	13	22	10	11
18	15	25	30	49
29	17	35	37	49
29	31	41	38	54

Partition on **25** to find that 25 is the 13th item in the set.

The 20th item in the set is therefore the 7th item greater than **25**.

All numbers >25 .

29	37	
35	30	
31	49	54
29	38	
41	49	

Sort in groups of 5 numbers

29	30	
29	37	
31	38	54
35	49	
41	49	

Recursively run **selection** to
find median of medians = **38**

29	30	
29	37	
31	38	54
35	49	
41	49	

Partition on **38** to find that 38
is the 7th item in the set.

This is what we are looking
for so 38 is the 20th item in
the full set. **FINISHED**

Review of steps

To find 20th of 45.

Found 25th item.

Searched for 20th of first 24.

Found 13th item.

Searched for 7th of Nos 14-24.

Found 7th item.

Stopped.