Selection Example

Goal: to pick the 20^{th} number from 45

Input: 45 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

(perhaps 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 the 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 20^{th} of 45.

Found 25^{th} item.
Searched for 20^{th} of first 24.

Found 13^{th} item.
Searched for 7^{th} of Nos 14-24.

Found 7^{th} item.
Stopped.