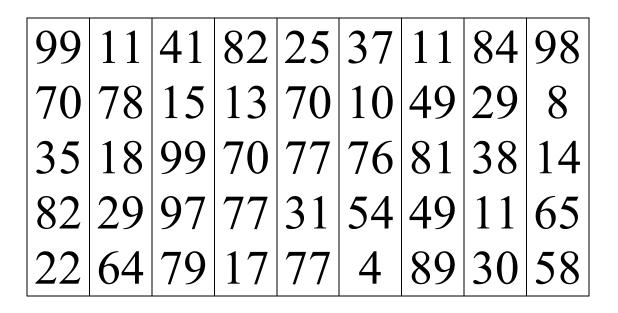
Selection Example

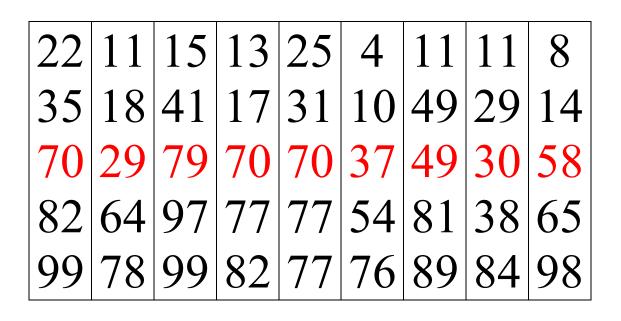
## Goal: to pick the 20<sup>th</sup> number from 45

Input: 45 random numbers:



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

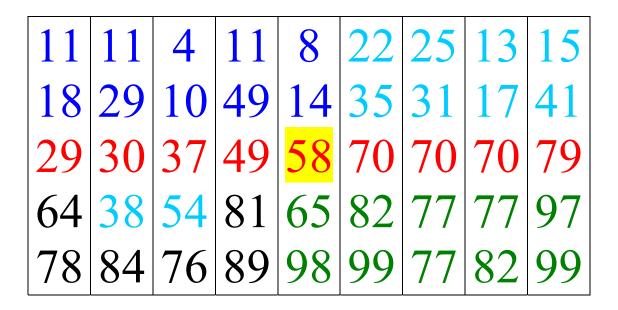
Median of each set is in red.



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.



Run partition on full set using 58 as pivot. Find that 58 is 25<sup>th</sup> number in set.

To find 20<sup>th</sup> in full set it's enough to find 20<sup>th</sup> in set of first 24 items (which we know from partition). All numbers < 58:

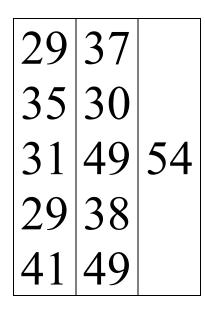
## Sort in groups of 5 numbers

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

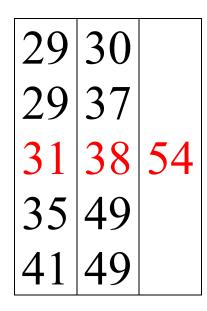
Partition on 25 to find that 25 is the 13<sup>th</sup> item in the set.

The 20<sup>th</sup> item in the set is therefore the 7<sup>th</sup> item greater than 25.

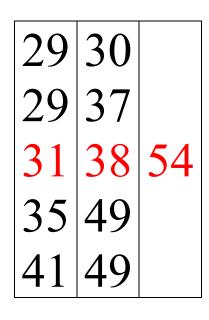
#### All numbers >25.



### Sort in groups of 5 numbers



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



Partition on 38 to find that 38 is the 7<sup>th</sup> item in the set.

This is what we are looking for so 38 is the 20<sup>th</sup> item in the full set. FINISHED

#### **Review of steps**

To find  $20^{\text{th}}$  of 45.

Found 25<sup>th</sup> item. Searched for 20<sup>th</sup> of first 24.

Found 13<sup>th</sup> item. Searched for 7<sup>th</sup> of Nos 14-24.

Found 7<sup>th</sup> item. Stopped.