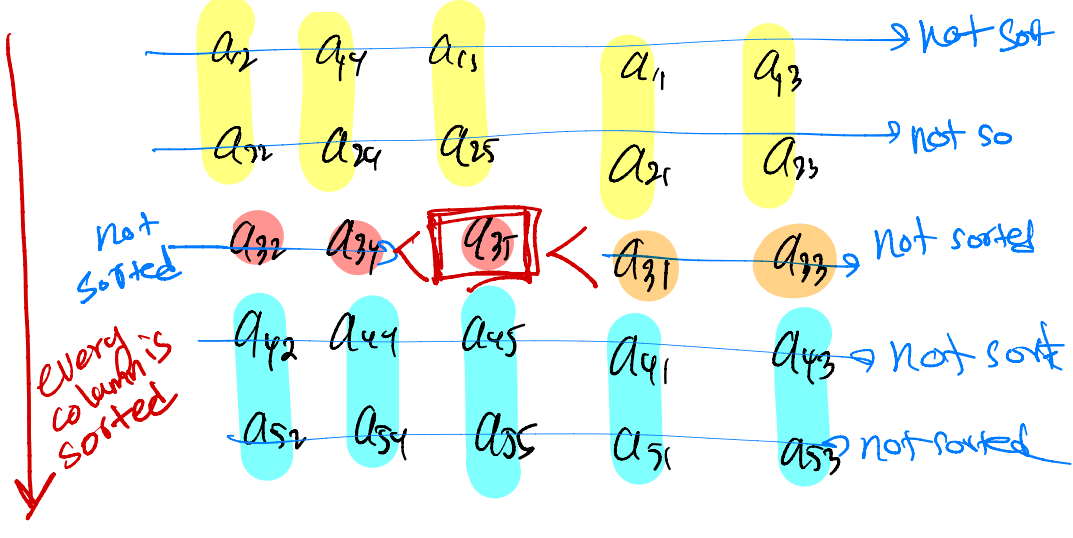
CMSC 351 (2022 S)

Quickselect algorithm for finding the k^{th} small/largest element in an array

This document can be used a supplementary material for the PDF lecture notes on
https://www.math.umd.edu/~immortal/CMSC351/notes/kthorder.pdf



Note:- Elements are sorted along the columns ↓

Elements are not sorted along the rows →

However MOM is smaller than or equal to two medians and greater than or equal to another two medians

$f_5(n)$ is the # elements smaller than MoM

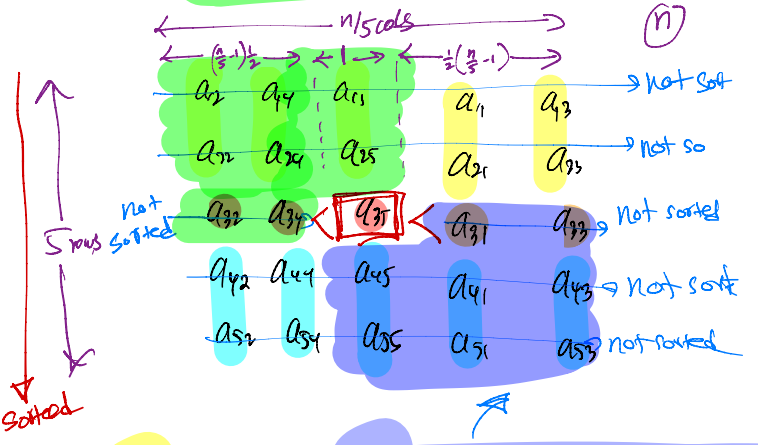
$$\frac{3n}{10}+\frac{1}{2} \le f_5(n) \le \frac{3n}{10}+\frac{1}{2}+\frac{2n}{5}-2$$

$$\frac{3n}{10}+\frac{1}{2} \le f_5(n) \le \frac{7n}{10}-\frac{3}{2}$$

$$3n/10 \le f_5(n) \le 7n/10$$

Definitely Smaller than M

$$= 3\left(\frac{n}{5}-1\right)\frac{1}{2}+2 = \frac{3n}{10}+\frac{1}{2}$$



Definitely larger than M

$$\left(\frac{3n}{10}+\frac{1}{2}\right)$$

No idea

$$= 2\left(\frac{n}{5}-1\right)\frac{1}{2}\times 2$$

$$= \frac{2n}{5}-2$$

$f_6(n)$ is the # of elements larger than MoM

$$\boxed{3n/10} \le f_6(n) \le \boxed{7n/10}$$