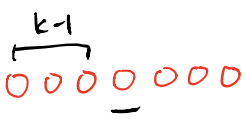
k=4



to look for kth element,

there should be k-1 elements

on the left

k=4. [1. 9. 5. 3. 2. 7. 4. 6].

first partition

[1. 5. 3. 2. 4. 6. 7. 9]

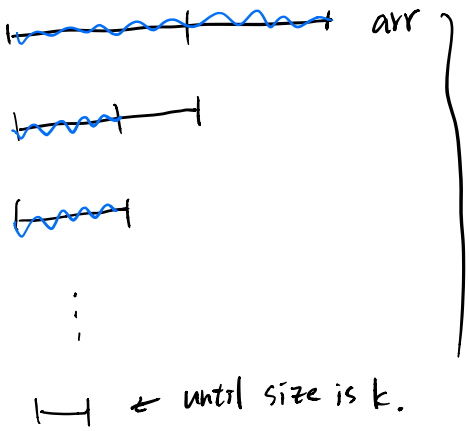
p=5

partition

[1. 3. 2. 4. 5]

p=3.

Time complexity of quick select.



$n + (\frac{1}{2}) \cdot n + (\frac{1}{2})^2 \cdot n \cdots + k.$

$(\frac{1}{2})^x \cdot n = k.$

$n = k \cdot 2^x$

$x = \log_2 n/k.$ times.

← until size is k.

time complexity:

$n(1 + \frac{1}{2} + \frac{1}{4} + \dots k)$

$= n. \frac{1 \cdot (1 - (\frac{1}{2})^x)}{1 - \frac{1}{2}}$

$= 2n. (1 - (\frac{1}{2})^{\log_2 n/k}) < 2n$

⇒ time complexity is $O(n)$