

# QUICK SORT

## BEST CASE

- WE DIVIDE THE PROBLEM IN HALF

$$Q(n) = \begin{cases} c, & n \leq 1 \\ 2Q(n/2) + n, & n > 1 \end{cases}$$

$$i=1 \quad Q(n) = 2Q(n/2) + n$$

$$i=2 \quad Q(n) = 2(2Q(n/4) + n) + n$$

$$Q(n) = 4Q(n/4) + 2n$$

$$i=k \quad Q(n) = 2^k Q(n/2^k) + kn$$

$$k = \log n \quad Q(n) = n Q(1) + n \log n \in O(n \log n)$$

## WORST CASE

- WE SUBTRACT THE PROBLEM BY 1

$$Q(n) = \begin{cases} c, & n \leq 1 \\ 2Q(n-1) + n, & n > 1 \end{cases}$$

$$i=1 \quad Q(n) = 2Q(n-1) + n$$

$$i=k \quad Q(n) = 2^k Q(n-k) + kn$$

$$k=n \quad Q(n) = 2^n Q(0) + n^2 \in O(n^2)$$