

HW 1 Problem 1

3 9 7 4 1 8 3

3 ⑨

3 9 ⑦

3 7 9 ④

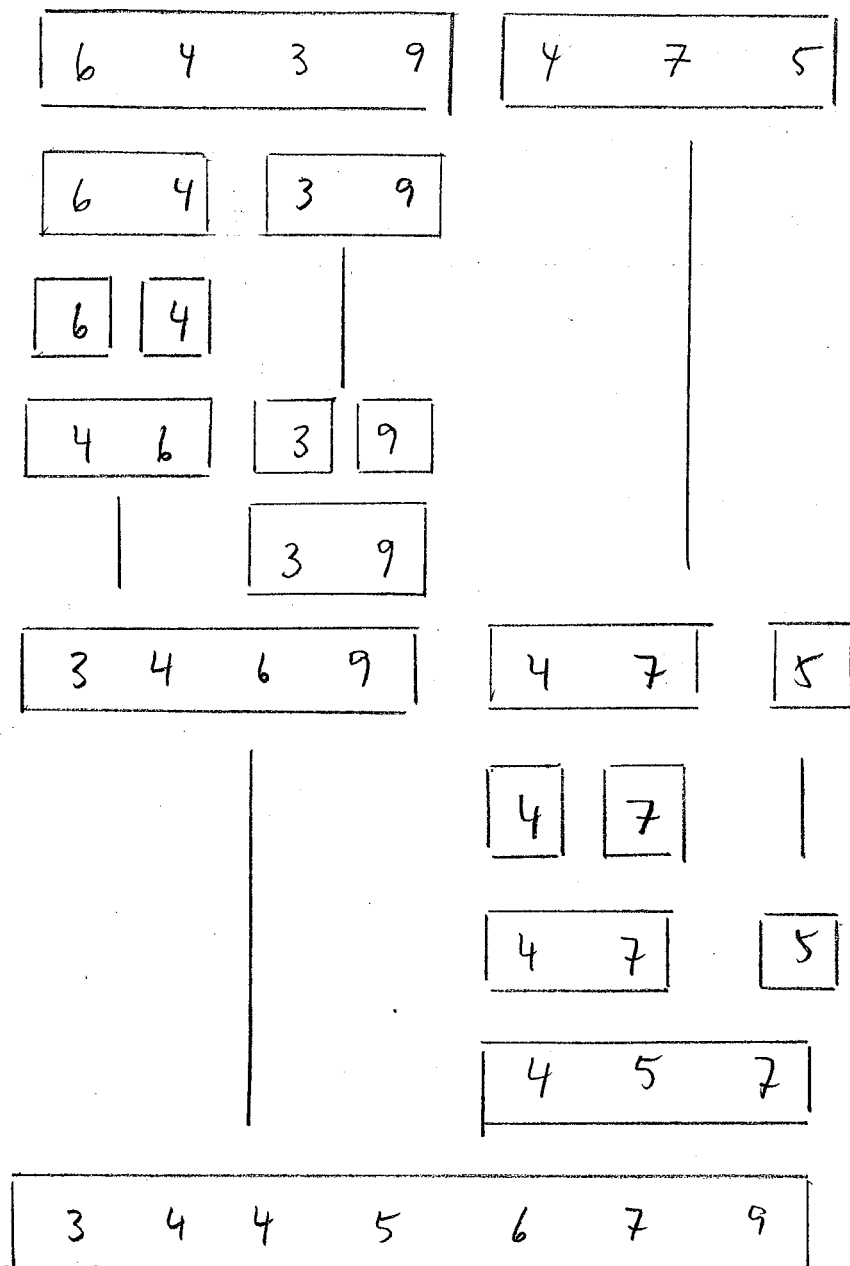
3 4 7 9 ①

1 3 4 7 9 ⑧

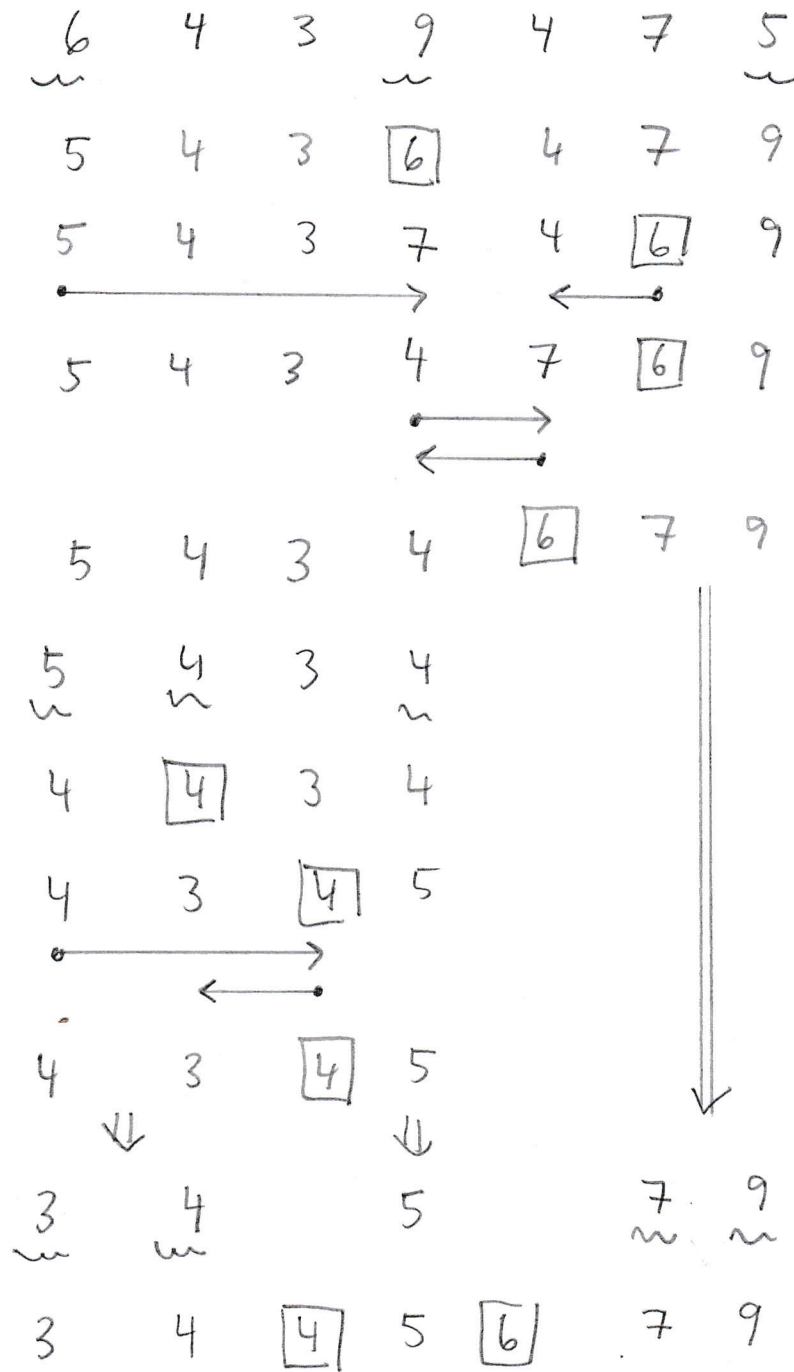
1 3 4 7 8 9 ③

1 3 3 4 7 8 9

HW2 Problem 1



HW3, Problem 1



Sorted list

HW4, Problem 1

$$T(1) = 1$$

$$T(N) = 2 T(N/2) + cN$$

$$\begin{aligned} \Downarrow \quad \frac{T(N)}{N} &= \frac{T(N/2)}{N/2} + c \\ \frac{T(N/2)}{N/2} &= \frac{T(N/4)}{N/4} + c \\ &\vdots \\ \frac{T(2)}{2} &= \frac{T(1)}{1} + c \end{aligned} \quad \left. \vphantom{\begin{aligned} \frac{T(N)}{N} &= \frac{T(N/2)}{N/2} + c \\ \frac{T(N/2)}{N/2} &= \frac{T(N/4)}{N/4} + c \\ &\vdots \\ \frac{T(2)}{2} &= \frac{T(1)}{1} + c \end{aligned}} \right\} \log N \text{ expressions}$$

$$\Downarrow \quad \frac{T(N)}{N} = \frac{T(1)}{1} + c \log N$$

$$\begin{aligned} \Downarrow \quad T(N) &= NT(1) + cN \log N \\ &= O(N \log N) \end{aligned}$$

HW 4, Problem 2

$$T(1) = 1$$

$$T(N) = 2T(N/2) + cN$$

⇓

$$T(N) = 2(2T(N/4) + cN/2) + cN$$

$$= 4T(N/4) + c2N$$

⇓

$$T(N) = 4(2T(N/8) + cN/4) + c2N$$

$$= 8T(N/8) + c3N$$

⇓

$$T(N) = 2^k T(N/2^k) + c k N, \quad \max k = \log N$$

⇓

$$T(N) = 2^{\log N} T(N/2^{\log N}) + c N \log N$$

$$= N T(1) + c N \log N$$

$$= O(N \log N)$$