

$$w_n = \lfloor \log_2 n \rfloor + 1 \quad n \geq 1$$

$$\log_2 n \leq w_n \leq \log_2 n + 1 \quad \begin{array}{l} \text{for} \\ n=2 \\ \log_2 n = 1 \end{array}$$

$$w_n \leq \log_2 n + \log_2 n$$

for $n \geq 2$

$$= 2 \cdot \log_2 n$$

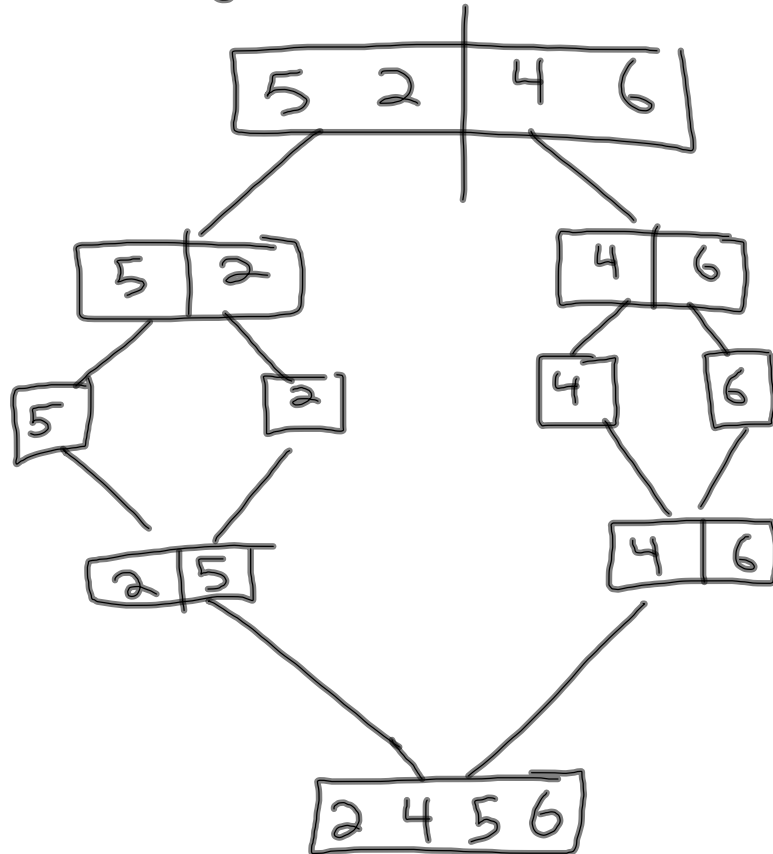
$$|\log_2 n| \leq |w_n| \leq 2 \cdot |\log_2 n|$$

for all $n \geq 2$

$$w_n \text{ is } \Theta(\log_2 n)$$

Merge Sort.

1. split list into 2 sub-lists
- sort the sublists (recursive)
2. merge sublists



$$m_k = \underbrace{m_{\lfloor k/2 \rfloor} + m_{\lceil k/2 \rceil}}_{\text{split}} + \underbrace{(k-1)}_{\text{merge}}$$

$$n \cdot \log_2 n \leq m_n \leq 2 \cdot n \log_2 n$$

$$\Theta(n \log_2 n)$$