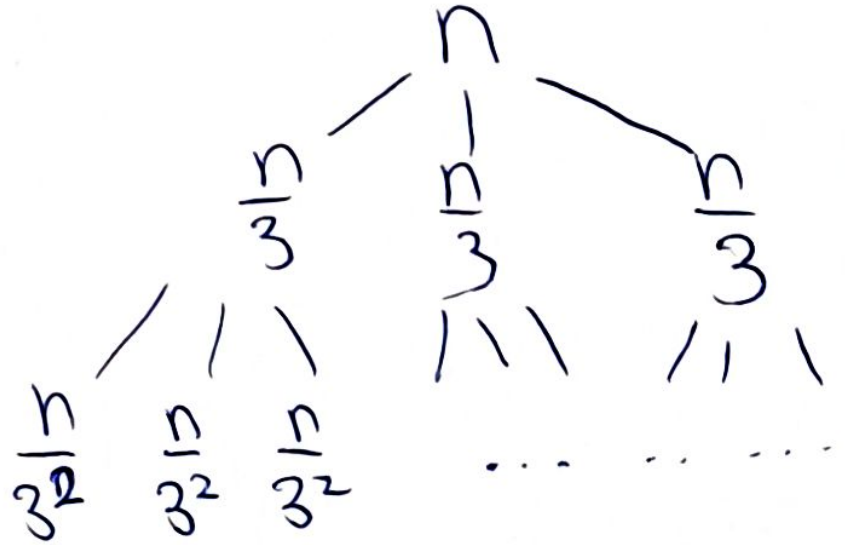
Best Case:

$$T(n) = 3T(n/3) + O(n)$$



$= 3 \cdot \frac{n}{3} = n$

$= 3^2 \cdot \frac{n}{3^2} = n$

$= 3^i \cdot \frac{n}{3^i} = n$

Height of tree: $\frac{n}{3^i} = 1$

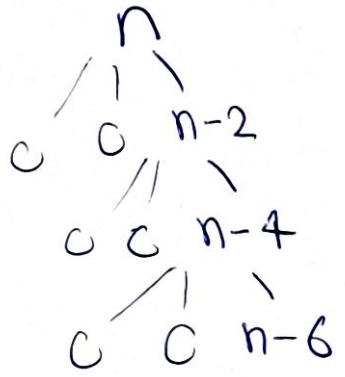
$\Downarrow$

$\log_3 n$

Time Complexity: $\sum_{i=0}^{\log_3 n} n$ $\boxed{= n \log_3 n}$

Worst Case:

$T(n) = T(n-2) + O(n)$



$= n - (2 \cdot 1)$

$= n - (2 \cdot 2)$

$= n - (2 \cdot 3)$

$= n - 2i$

Height of tree: $n - 2i = 0$

$2i = n$

$i = \frac{n}{2}$

Time complexity: $\sum_{i=0}^{n/2} n - 2i = \sum_{i=0}^{n/2} n - 2 \sum_{i=0}^{n/2} i = \frac{n^2}{2} - 2 \cdot \frac{n^2+2n}{8 4}$

$= \frac{n^2}{2} - \frac{n^2+2n}{4} = \frac{2n^2 - n^2 + 2n}{4} = \frac{n^2 - 2n}{4}$ $= O(n^2)$