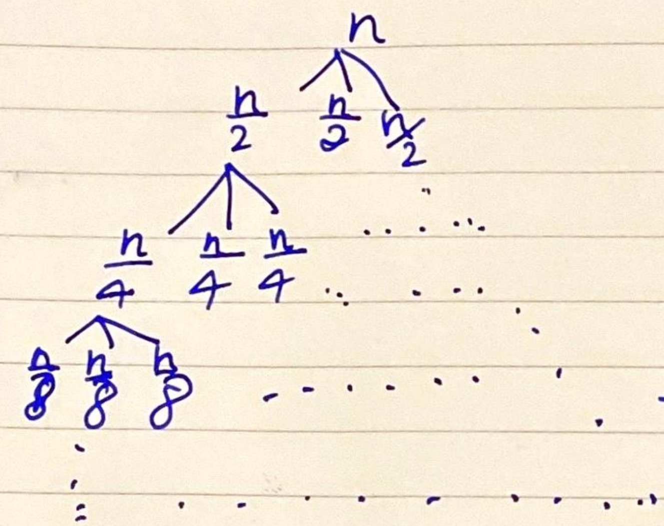
Recursion tree Method



Level		Level Sum
0	$\rightarrow$	n
1	$\rightarrow$	$3\left(\frac{n}{2}\right)$
2	$\rightarrow$	$3^2\left(\frac{n}{2^2}\right)$
3	$\rightarrow$	$3^3\left(\frac{n}{2^3}\right)$
⋮		
h	$\rightarrow$	$3^i \frac{n}{2^i}$

$$\frac{n}{2^h} = 1 \Rightarrow h = \log_2 n$$

Time complexity is given by summing the levels

$\therefore$ We have $n + \frac{3}{2} + 3^2\left(\frac{n}{2^2}\right) \cdots 3^i \frac{n}{2^i}$

$$= n \cdot \underbrace{\sum_{i=0}^{h} \left(\frac{3}{2}\right)^i}_{\text{Geometric series with}}$$

$a = 1$, $r = 3/2$

$$\therefore S_\infty = \frac{a(r^k - 1)}{r - 1} = \frac{\left(\left(\frac{3}{2}\right)^h - 1\right)}{0.5}$$

$$T(n) = 2n\left(\left(\frac{3}{2}\right)^h - 1\right)$$

$$= 2n\left(\left(\frac{3}{2}\right)^{\log_2 n} - 1\right) \quad \because [h = \log_2 n]$$

$$= 2n\left[n^{\log_2 \frac{3}{2}} - 1\right] \quad \because [a^{\log b} = b^{\log a}]$$

$$= 2n\left[n^{\log_2 3/2} - 1 \right]$$

$$= 2n \cdot n^{\log_2 3/2} - 2n$$

$$= 2n^{1+\log_2 3/2} - 2n$$

$$= 2n^{\log_2 2 + \log_2 3/2} - 2n$$

$$= 2n^{\log_2 3} - 2n$$

$$2\left[n^{\log_2 3} - n \right]$$

$$\left[n^1 \cdot n^{\log_2 3/2} = n^{1+\log_2 3/2} \right. = n^{\log_2 2 + \log_2 3/2}$$

$$= a^b \cdot a^c = a^{b \cdot c}$$

$$\because \left[\log_a b + \log_a c = \log_a bc \right.$$

$n^{1.58} = n^{\log_2 3}$ is greater than n therefore

$\cancel{T(n) = }$ $\Theta(n) = n^{\log_2 3} \approx n^{1.58}$