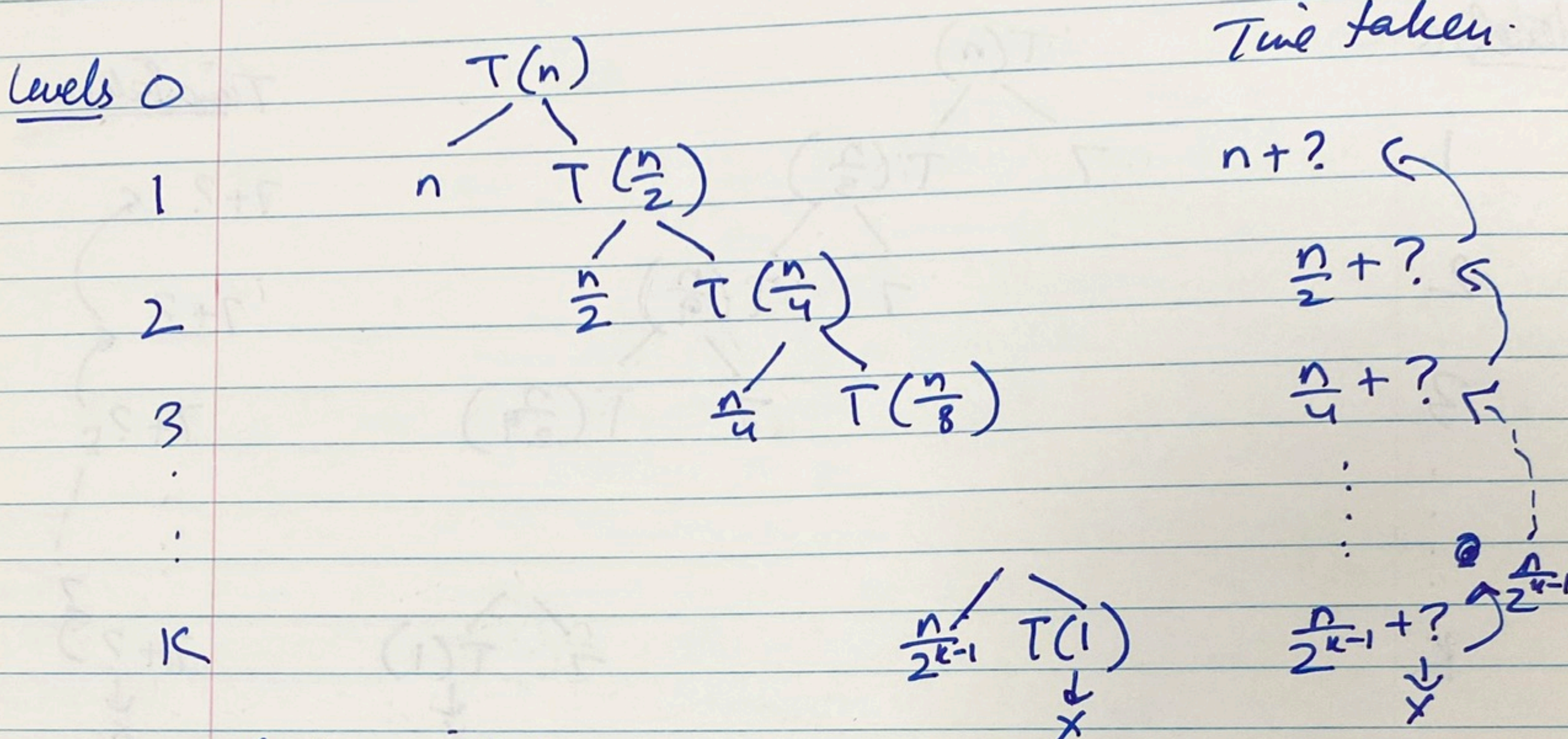
Eg) $T(n) = \begin{cases} T\left(\frac{n}{2}\right) + n & , n > 1 \\ 1 & , n = 1 \end{cases}$



Series will be:

$= n + \frac{n}{2} + \frac{n}{4} + \cdots + \frac{n}{2^{k-1}}$

$= n\left(1 + \frac{1}{2} + \frac{1}{4} + \cdots + \frac{1}{2^{k-1}}\right)$

$= n\left\{\underbrace{\left(\frac{1}{2}\right)^0 + \left(\frac{1}{2}\right)^1 + \left(\frac{1}{2}\right)^2 + \cdots + \left(\frac{1}{2}\right)^{k-1}}_{\text{Geometric series } a=1,\ r=\frac{1}{2},\ n=k-1}\right\}$

$= n\left\{1\left(\frac{1-\left(\frac{1}{2}\right)^{k-1}}{1-\frac{1}{2}}\right)\right\} = n\left(\frac{\frac{2^{k-1}-1}{2^{k-1}}}{\frac{1}{2}}\right) = 2n\left(1 - \frac{1}{2^{k-1}}\right)$

$= 2n\left(1 - \frac{2}{2^k}\right)$

Base cond: $\frac{n}{2^k} = 1 \Rightarrow k = \log n$

Sub in series: $2n\left(1 - \frac{2}{2^{\log n}}\right) = 2n\left(1 - \frac{2}{n}\right) = 2n - 2\cancel{n}\left(\frac{2}{\cancel{n}}\right)$

$= 2n - 4$

Dominant term

$\therefore \boxed{O(n)}$