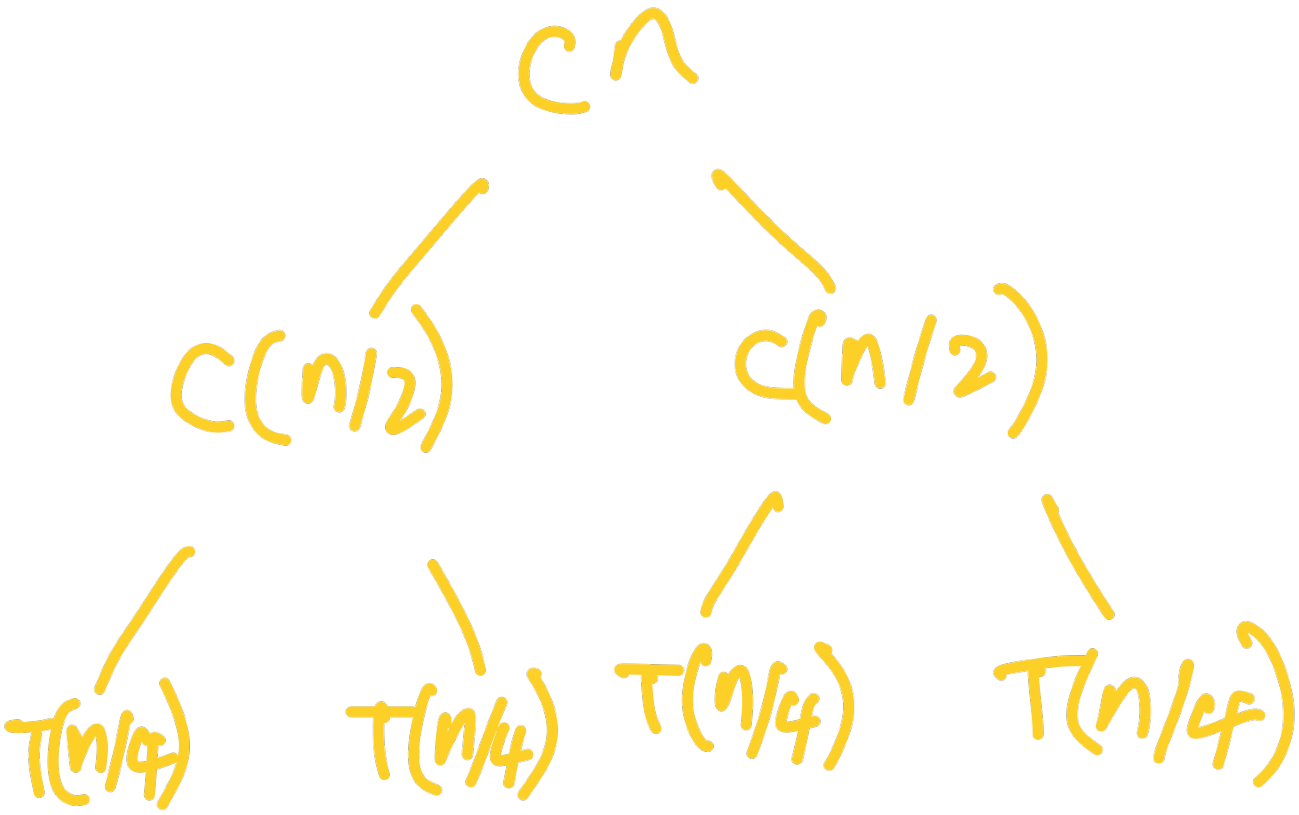
Solve with recursion tree Method:

$T(n) = 2T(n/2) + cn$



Problem size is $n/4$

Work at $T(n/4) \rightarrow c(n/4)$

$4\,c(n/4) \rightarrow \left(\frac{4}{4}\right)cn$

$T(n) = O(n(1 + \ln x))$

With asymptotic behaviour we can say $\ln x$ and $\log x$ are equivalent.

Remove lower order terms and constents

$T(n) = O(n + n \log n)$

$T(n) = O(n \log n)$

$T(n) = cn + 1 \cdot n + 1 \cdot n \ldots + n$

Level $\log n$ → work is

$n \cdot n/n$

Ex: Level $\log 8$ → level 3

Work is → $8 \cdot 8/8 = 8$

Total Cost:

Work at each level * the number of levels → $O(n \log n)$