Analysis

The non-recursive steps takes $O(n)$ time including finding median and other statements.

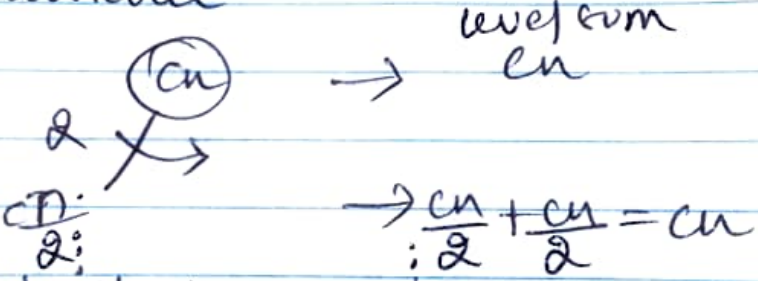
for recursive calls, we are dividing the space into two halves, using a linear

so our $T(n)$ becomes

$$T(n) = \begin{cases} c & \text{if } n < 2 \\ 2T(n/2) + cn & \text{if } n \geq 2 \end{cases}$$

for some constant c

Solving recurrence



So at every level, the level sum remains constant which means.

So tight bound is root * depth.

Depth of the tree is $\log n$ and root is n

$$O(n \log n)$$

Hence the running time is $O(n \log n)$

This running time is achieved because at every level we are splitting the space into two halves using the median as the dividing line.