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Ejercicio 2

Bucle for Interno:

$$T(n) = \begin{cases} 1 & n \leq 1 \\ 4 \cdot T(n/2) + n & n > 1 \end{cases}$$

Bucle for externo: $\longrightarrow = 1 + \sum_{i=1}^{n-2} (1) = n-2+1 = n-1 \in \Theta(n)$

$$T(n) = 4 \cdot T\left(\frac{n}{2}\right) + n \qquad i = 1$$

$$= 4\left[4 \cdot T\left(\frac{n}{2}\right) + \frac{n}{2}\right] + n = 4^2 \cdot T\left(\frac{n}{4}\right) = 4^2\left[4 \cdot T\left(\frac{n}{8}\right) + \frac{n}{4}\right] + 4\frac{n}{2} + n$$

$$= 4^3 \cdot T\left(\frac{n}{8}\right) + 4^2 = 4^3\left[4 \cdot T\left(\frac{n}{16}\right) + \frac{n}{8}\right] + 4^2\frac{n}{4} + \frac{4n}{2} + n =$$

$$= 4^4 \cdot T\left(\frac{n}{16}\right) + 4^3 \cdot \left(\frac{n}{8}\right) + 4^2\left(\frac{n}{4}\right) + \frac{4n}{2} + n =$$

$$(i=4) = 4^4 \cdot T\left(\frac{n}{16}\right) + 2^3 n + 2^2 n + 2^1 \cdot n + 1 \cdot n$$

$$= 4^i \cdot T\left(\frac{n}{2^i}\right) + n \sum_{p=0}^{i-1} 2p$$

$$\# \cancel{4\ log} = 4^{\log_2 n} + \sum_{p=0}^{\log_2(n)-1} 2^p = 4^{\log_2 n} + 2^0 \frac{2^{\boxed{\log_2 n}} - 1}{2-1}$$

$\log_2 n - 1 - 0 + 1$

$$= (2^2)^{\log_2 n} = (2^{2 \cdot \log_2 n})^2 = \boxed{n^2}$$