Resumen

1. Algoritmo Iterativo

Planteo inicial:

$$T(n) = c1 + \sum_{i=1}^{n} \sum_{j=i}^{n} c2$$

Se pasa a resolver...

$$T(n) = c1 + \sum_{i=1}^{n} \sum_{j=i}^{n} c2$$

$$T(n) = c1 + \sum_{i=1}^{n} \left(\sum_{j=1}^{n} c2 - \sum_{j=1}^{i-1} c2 \right)$$

$$T(n) = c1 + \sum_{i=1}^{n} \left(n * c2 - (i-1) * c2 \right)$$

$$T(n) = c1 + \sum_{i=1}^{n} c2 \left(n - (i-1) \right)$$

$$T(n) = c1 + \sum_{i=1}^{n} c2 \left(n - i + 1 \right)$$

$$T(n) = c1 + c2 \sum_{i=1}^{n} \left(n - i + 1 \right)$$

$$T(n) = c1 + c2 \left(\sum_{i=1}^{n} n - \sum_{i=1}^{n} i + \sum_{i=1}^{n} 1 \right)$$

$$T(n) = c1 + c2 \left(n * n - \frac{n(n+1)}{2} + n \right)$$

$$T(n) = c1 + c2 \left(n * n - \frac{n^2 + n)}{2} + n \right)$$

$$T(n) = c1 + c2 \left(n^2 - \frac{n^2}{2} - \frac{n}{2} + n \right)$$

$$T(n) = c1 + c2 * n^2 - \frac{c2}{2} * n^2 - \frac{c2}{2} * n + c2 * n$$

2. Algoritmo Recursivo

$$T(n) = \begin{cases} 2 & \text{si } n = 1 \\ 8T\left(\dfrac{n}{2}\right) + n^3 & \text{si } n \geq 2 \end{cases}$$

Se pasa a resolver...

Paso 1

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

Paso 2

$$8\left[8T\left(\frac{n/2}{2}\right) + \left(\frac{n}{2}\right)^3\right] + n^3$$

$$8^2 T\left(\frac{n/2}{2}\right) + 8\left(\frac{n}{2}\right)^3 + n^3$$

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

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

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

Paso 3

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

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

$$8^3 T\left(\frac{n}{8}\right) + 3n^3$$

Paso i

$$8^i T\left(\frac{n}{2^i}\right) + in^3$$

¿Caso base?

$$\frac{n}{2^i} = 1$$
$$n = 2^i$$
$$2^i = n$$
$$i = log_2(n)$$

Reemplazamos valor de i

$$T(n) = 8^{log_2(n)} T\left(\frac{n}{2^{log_2(n)}}\right) + log_2(n)n^3$$

$$T(n) = (2^3)^{log_2(n)} T(1) + log_2(n)n^3$$

$$T(n) = 2^{(3*log_2(n))} * 2 + log_2(n)n^3$$

$$T(n) = 2^{(log_2(n)*3)} * 2 + log_2(n)n^3$$

$$T(n) = (2^{log_2(n)})^3 * 2 + log_2(n)n^3$$

$$T(n) = n^3 * 2 + log_2(n)n^3$$