ANÁLISIS DE COMPLEJIDAD EJERCICIO #6 - VLAD AND A SUM OF DIGITS

Análisis método cándido:

$$T(n) = 3 + \sum_{i=0}^{n}(5 + 6(\sum_{j=0}^{n}(6+4+2+2) + \sum_{k=1}^{n}(6+2+2+1\sum_{l=k}^{\log 10n}(2+2+1)+6+5+2+2))+6+1+2)+1$$

$$T(n) = 4 + \sum_{i=0}^{n}(20(\sum_{j=0}^{n}(14) + \sum_{k=1}^{n}(26\sum_{l=k}^{\log 10n}(5))))$$

$$T(n) = 4 + \sum_{i=0}^{n}(20(\sum_{j=0}^{n}(14) + \sum_{k=1}^{n}(26(\log 10n - k + 1)*5))))$$

$$T(n) = 4 + \sum_{i=0}^{n}(20(\sum_{j=0}^{n}(14) + \sum_{k=1}^{n}(130\log 10n - 130k + 130))))$$

$$T(n) = 4 + \sum_{i=0}^{n}(20(\sum_{j=0}^{n}(14) + \sum_{k=1}^{n}(130\log 10n) - \sum_{k=1}^{n}(130k) + \sum_{k=1}^{n}(130)))$$

$$T(n) = 4 + \sum_{i=0}^{n}(20(\sum_{j=0}^{n}(14) + 130\sum_{k=1}^{n}(\log 10n) - 130\sum_{k=1}^{n}(k) + 130n))$$

$$T(n) = 4 + \sum_{i=0}^{n}(20(14n + 130nlog10n - 130(\frac{n(n+1)}{2}) + 130n))$$

$$T(n) = 4 + \sum_{i=0}^{n}(20(14n + 130nlog10n - 65n^2 - 65n + 130n))$$

$$T(n) = 4 + 20\sum_{i=0}^{n}(79n + 130nlog10n - 65n^2)$$

$$T(n) = 4 + 20\sum_{i=0}^{n}(79n) + 20\sum_{i=0}^{n}(130nlog10n) - 20\sum_{i=0}^{n}(65n^2)$$

$$T(n) = 4 + 1580n^2 + 2600n^2log10n - 1300n^3$$

$$T(n) \in O(n^3)$$

Análisis método óptimo:

$$T(n) = 3 + \sum_{i=0}^{n} (5 + 6 + 1 + 2) + 1$$

$$T(n) = 4 + \sum_{i=0}^{n} (14)$$

$$T(n) = 4 + 14n$$

$$T(n) \in O(n)$$

Método auxiliar:

$$T(n) = \sum_{i=0}^{n} (5 + 4 + 1 + 2) + \sum_{i=1}^{n} (5 + 2 + 2 + 1 \sum_{j=1}^{\log 10(n)} (2 + 2 + 1) + 6 + 5 + 1 + 2) + 1$$

$$T(n) = \sum_{i=0}^{n} (12) + \sum_{i=1}^{n} (24 \sum_{j=1}^{\log 10(n)} (5)) + 1$$

$$T(n) = 12n + \sum_{i=1}^{n} (24(5 \log 10(n) - 5i + 5)) + 1$$

$$T(n) = 12n + 120 \sum_{i=1}^{n} (\log 10(n) - 120 \sum_{i=1}^{n} (i) + 120 \sum_{i=1}^{n} (1) + 1$$

$$T(n) = 12n + 120n \log 10(n) - 60n^2 - 60n + 120n + 1$$

$$T(n) = 72n + 120n \log 10(n) - 60n^2$$

$$T(n) \in O(n^2)$$