

## AYED, ejercicios léxicos de análisis de algoritmos.

1)  $\sqrt{n}, n, 3^n, n^2, \log_2^2(n), \log_3(n), \log_2(n) \Rightarrow \log_2^2(n), \log_3(n), \log_2(n), \sqrt{n}, n, n^2, 3^n$

$\downarrow$   $\downarrow$   
 $\ln n$   $\ln n$

2)  $\{ \text{int } j: 4; j < n; j = j + 2 \}$   
 $\text{vol} = 0; \text{ck}_1$   
 $\{ \text{int } i: 0; i < j; i = i + 1 \}$   
 $\text{vol} = \text{vol} + i; \text{ck}_3$   
 $\{ \text{int } k: 0; k < n; k = k + 1 \}$   
 $\text{vol} += k; \text{ck}_2$   
 $\}$

$$\sum_{j=1}^{\left(\frac{n-1}{2}\right)} \left( \sum_{i=1}^j \left( \sum_{k=1}^n \text{ck}_2 \right) \right) = \sum_{j=1}^3 \left( \sum_{i=1}^j \left( \sum_{k=1}^n \text{ck}_2 \right) \right)$$

$$\sum_{j=1}^{\left(\frac{n-1}{2}\right)} j \cdot n \cdot \text{ck}_2 = \sum_{j=1}^3 j \cdot n \cdot \text{ck}_2$$

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

$$n \cdot \text{ck}_2 \cdot \left( \frac{\frac{n-1}{2} \cdot \left( \frac{n-1}{2} + 1 \right)}{2} \right) = n \cdot \text{ck}_2 \cdot \left( \frac{3 \cdot 4}{2} \right)$$

$$n \cdot \text{ck}_2 = \frac{(n-1) \cdot (n-1+1)}{8} = n \cdot \text{ck}_2 \cdot \frac{12}{2}$$

3)  $T(n) = n^x / \log(n)$  10.000 op/sec  
 $n = 1024$

$$n \cdot \text{ck}_2 = \left( \frac{n^2 - 1}{8} \right) = 6n \cdot \text{ck}_2 \quad T(1024) = 1024^x / \log(1024) = 3082$$

$$\frac{n^3}{8} \text{ck}_2 = \frac{n \cdot \text{ck}_2}{8} = 6n \cdot \text{ck}_2 \quad [O(n^3)]$$

10.000  $\rightarrow$  1 seg  
 3082  $\rightarrow$  0,3 seg

4)  $\sum_{i=3}^8 n^x i = \sum_{i=1}^8 n^x i = \sum_{i=1}^2 n^x i$

$$n \cdot \frac{8(8+1)}{2} = n \cdot \frac{2(1+1)}{2} = n \cdot 36 = n \cdot 3 \Rightarrow 36i = 3i \Rightarrow [33]$$

5)  $n^2 \in O(n^2), n^2 \in O(n^2), n^2 \in O(n^2 / \log n) \Rightarrow [e]$



6) void ejercicio6(int n) {

if (n > 2) {

2 \* ejercicio6(n/2); // 2T(n)  
n = n/2;  
ejercicio6(n/2); // T(n)

}

}

do/da

8) 100000 / seg.  
n = 1000

int count = 0; int n = 0; // log/h ck<sub>1</sub>

for (i = 0; i < n; i += n/2) {

for (int j = 0; j < n; j++) {

o[j]++; // ck<sub>2</sub>

}

$$T(n) = ck_1 + \sum_{i=1}^2 \left( \sum_{j=1}^n ck_2 \right) = T(n) = ck_1 + 2n(ck_2) = 2n$$

$$T(1000) = 2 \cdot 1000 = T(1000) = 2000$$

$$\frac{100000}{2000} = 0,2 \text{ seg} \quad \textcircled{d}$$

$$9) T(n) = \begin{cases} 4 & n=1 \\ 2T(n/2) + 5n + 1 & n \geq 2 \end{cases}$$

$$T(4) = \textcircled{4} 2T(4/2) + 5 \cdot 4 + 1$$

$$\textcircled{2} 2(2T(2/2) + 5 \cdot 2 + 1) + 5 \cdot 4 + 1$$

$$4(T(1)) + 22 + 21$$

$$4T(1) + 43$$

$$4 \cdot 4 + 43 = 59 \quad \textcircled{c}$$

10) public static void ejercicio10(int n) {

int x = 0; // ck<sub>1</sub>

int j = 1;

while (j <= n) {

for (int i = n/n; i >= 1; i = i - 3) {

x = x + 1; // ck<sub>2</sub>

j = j \* 2;

}

}

$$T(n) = ck_1 + \sum_{j=1}^{\log_2(n)} \frac{n^2}{3}$$

10) b) public static void ejercicio10(int n) {

int x = 0; // ck<sub>1</sub>

for (int i = 1; i <= n; i = i + 2) {

for (int j = 1; j <= i; j = j + 1) {

x = x + 1; // ck<sub>2</sub>

}

}

$$T(n) = ck_1 + \sum_{j=1}^{\log_2(n)} \sum_{i=1}^{n/3} ck_2 = \sum_{j=1}^{\log_2(n)} \frac{n^2}{3} ck$$

$$T(n) = ck \frac{1}{3} \sum_{j=1}^{\log_2(n)} n^2 = \frac{1}{3} \log_2(n) \cdot n^2$$