AYED - ejercicios teóricos de análisis de algoritmos

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

lineal

2)
```
for (int j=4; j<n; j=j+2 {
    val:0          cte1
    for (int i=0; i<j; ++i){
        val = val+i;   cte3
        for (int k=0; k<n; ++k){
            val++;  cte2
}
```

$$\sum_{j=1}^{\left(\frac{n-1}{2}\right)} \left(\sum_{i=1}^{j} \left(\sum_{k=1}^{n} cte_2 \right)\right) - \sum_{j=1}^{3} \left(\sum_{i=1}^{j} \left(\sum_{k=1}^{n} cte_2 \right)\right)$$

$$\sum_{j=1}^{(n-1/2)} j \cdot n \cdot cte_2 - \sum_{j=1}^{3} j \cdot n \cdot cte_2$$

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

$$n \cdot cte \cdot \left(\frac{\frac{n-1}{2} \cdot \left(\frac{n-1}{2}+1\right)}{2} \right) - n \cdot cte \left(\frac{3 \cdot 4}{2} \right)$$

$$n \cdot cte \cdot \frac{(n-1)\cdot(n-1+2)}{8} - n \cdot cte \frac{12}{2}$$

$$n \cdot cte \cdot \left(\frac{n^2-1}{8} \right) - 6n \cdot cte$$

$$\frac{n^3}{8} cte - \frac{n}{8} cte - 6n\, cte \quad \boxed{O(n^3)}$$

3) $T(n) = n^* \log(n)$ 10.000 op/seg

$n = 1024$

$T(1024) = 1024^* \log(1024) = 3082$

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

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

$$n \cdot \frac{8(8+1)}{2} - n \cdot \frac{2(2+1)}{2} = n\,36 - n3 \Rightarrow 36i - 3i = \boxed{33i}$$

c

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

6) void ejercicio6(int n){

```
    if (n≥2){
        2* ejercicio6 (n/2);      2(T(n)
        n = n/2;                  cte
        ejercicio6 (n/2);         T(n)
    }
}
```

$T(n) = d + T(n/2) + T(n/4)$

7) $T(n) \begin{cases} 1 & n<=1 \\ T(n/3)+c & n>1 \end{cases}$

$T(n/3) = T(n/3/3)+c$ d

datos

8) 100000 /seg
n=1000

```
int count=0;;int n= a.length cte1
for (i=0 ; i<n ; i+=n/2){
    for (int j=0; j<n; j++){
        a[j]++;   cte2
    }
```

$T(n) = cte_1 + \sum_{i=1}^{2}\left(\sum_{j=1}^{n} cte_2\right) = T(n) = cte_1 + 2n(cte_2) = 2n$

$T(1000) = 2.1000 = T(1000) = 2000$

100.000 — 1 seg
2000 — 0,2 seg

d

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

$T(4) =$ 1 $2\,T(4/2)+5.4+1$

2 $2(2T(2/2)+5.2+1]+5.4+1$

$4(T(1))+22+21$
$4T(1)+43$

$4.4+43 = 59$ c

10) public static void ejercicio(int n){

```
    int x=0;  cte1
    int j=1;
    while (j<=n){
        for (int i=n*n ; i>=1 ; i=i-3)
            x= x+1 cte2
        j=j*2;
    }
}
```

$T(n) = cte_1 + \sum_{j=1}^{\log_2(n)} \frac{n^n}{3}$

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

```
    int x=0  cte1
    for (int i=1;i<n; i=i+2)
        for(int j=1; j<=n; j++)
            x= x+1  cte2
}
```

$T(n) = cte_1 + \sum_{j=1}^{\log_2(n)} \sum_{i=1}^{n^2/3} cte_2 = \sum_{j=1}^{\log_2(n)} \frac{n^2}{3} cte$

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