1. Obtener el tiempo de ejecución $t(n)$, $O(t(n))$, $\Omega(t(n))$ y $\Theta(t(n))$ para el siguiente algoritmo de multiplicación de matrices.

```
for i=1 to n
  for j=1 to n
    suma = 0
    for k=1 to n
      suma = suma + a[i,k] · b[k,j]
    endfor
    c[i,j] = suma
  endfor
endfor
```

$$t(n) = \sum_{i=1}^{n}\left(\sum_{j=1}^{n}\left(1+\sum_{k=1}^{n}(1)+1\right)\right) =$$

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

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

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

$$= \sum_{i=1}^{n}(2n)+\sum_{i=1}^{n}(n^2) = 2n^2+\boxed{n^3}$$

$$\boxed{\begin{array}{l} t(n)=n^3 \\ O(n)=n^3 \\ \Omega(n)=n^3 \\ \Theta(n)=n^3 \end{array}}$$

2. Obtener O y Ω, y Θ del tiempo promedio para el algoritmo de búsqueda binaria.

```
- i = 1
- j = n
repeat
  m = (i+j) div 2
  if a[m] > x
    j = m-1
  else
    i = m+1
  endif
until i>j or a[m]=x
```

$t(n) =$

14. Dado el siguiente algoritmo:

```
var
  i, j : integer;
begin
  for i:=0 to n-1 do
    for j:= i+1 to n do
      A[i,j]:= 2*A[j,i]+A[i,j];
end;
```

$$t(n) = \sum_{i=0}^{n-1}\left(\sum_{j=i+1}^{n}(1)\right) =$$

$$= \sum_{i=0}^{n-1}\left(1\cdot(n-(i+1)+1)\right) =$$

$$= \sum_{i=0}^{n-1}(n-i) = \sum_{i=0}^{n-1}(n) - \sum_{i=0}^{n-1}(i) = n^2 - \frac{n^2-n}{2} =$$

$$= \frac{2n^2}{2} - \frac{n^2}{2} + \frac{n}{2} = \boxed{\frac{n^2+n}{2}}$$

1 EXAMEN_SAMV Calcula el tiempo mejor, peor y promedio.

a)
```
for (int i=0; i<N; i++){
  if (datos[i] % 3 == 0){
    x++;
  }
}
```

$$t(n) = \sum_{i=1}^{n}(1+p_a\cdot t_a+p_g\cdot t_g) =$$

$$= \sum_{i=1}^{n}(1+(1/3\cdot 1+2/3\cdot 0) =$$

$$= \sum_{i=1}^{n}\left(1+\frac{1}{3}\right) =$$

1) (3 puntos) Dado el código:

```
i = 1; aux=0;
while i<=n
   index = M[1,i];
   k=i+1;
   while k<=n and index!=M[k,i]
      if index < M[k,i], index = M[i,k]; else index = M[k,i]; endif
      j=1;
      while j<= n
         if(M[k,j]>aux), aux--; endif
         j=j*2;
      endwhile
      k++;
   endwhile
   i++;
endwhile
```

donde M:array$[1..n+1,\ 1..n+1]$ de enteros, estudiar los órdenes O, Ω y Θ de $t(n)$.

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

```
suma
for i=0 a n
  if
    for j=0 a n
      suma 1+
    finfor
  finif
finfor
-> suma
i++
if (a[i] > a[n]){
  a[n] = a[i];
}
```

$$t(n) = 1+\sum_{i=0}^{n}(t_{if}+1)$$

$$t_p(n) = 1+\sum_{i=0}^{n}\left(\left(t_a\cdot p_a+t_g\cdot p_g\right)+1\right) =$$

else

$$= 1+\sum_{i=0}^{n}\left(\sum_{j=0}^{n}(1)\cdot\frac{1}{i+1}+1\right) =$$

$$= 1+\sum_{i=0}^{n}\left(\frac{n}{i+1}+1\right) =$$

1 2 3 4 5

$\Rightarrow \frac{1}{i+1}$

$\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{6}$