01. $\sum_{k=1}^{n}(c.a_k+b_k)=c.\sum_{k=1}^{n}a_k+\sum_{k=1}^{n}b_k \rightarrow \sum_{k=1}^{n}\Theta[f(k)]=\Theta[\sum_{k=1}^{n}f(k)]$

02. $\sum_{k=1}^{n}k=\frac{n(n+1)}{2}$ 03. $\sum_{k=1}^{n}k^2=\frac{n(n+1)(2n+1)}{6}$ 04. $\sum_{k=1}^{n}k^3=[\sum_{k=1}^{n}k]^2=\frac{n^2(n+1)^2}{4}$

05. $\sum_{k=1}^{n}k^4=\frac{n(n+1)(6n^3+9n^2+n-1)}{30}$ 06. $\sum_{k=1}^{n}k^p\approx\Theta(N^{p+1})$

07. $\sum_{k=0}^{n}x^k=\frac{x^{n+1}-1}{x-1}$ (PG finita, razão $x\neq 1$) 08. $\sum_{k=0}^{\infty}x^k=\frac{1}{1-x}$ (PG infinita, razão $|x|<1$)

09. $\sum_{k=1}^{n}\frac{1}{k}=\ln(n)+O(1)$ 10. $\sum_{k=1}^{\infty}k.x^k=\frac{x}{(1-x)^2}$ para $|x|<1$

11. $\sum_{k=1}^{n}k.x^k=\frac{x-(n+1)x^{n+1}+n.x^{n+2}}{(1-x)^2}$ para $x\neq 1$

12. $\sum_{k=1}^{n}k.2^k=(n-1).2^{n+1}+2$ 13. $\sum_{k=1}^{n-1}\frac{1}{k(k+1)}=\sum_{k=1}^{n-1}\frac{1}{k}-\sum_{k=1}^{n-1}\frac{1}{k+1}$

14. a) $\sum_{k=1}^{n}\binom{n}{k}=2^n$ b) $\sum_{k=1}^{n}\binom{k}{m}=\binom{n+1}{m+1}$ c) $\max_{1\leq k\leq n}\left\{\binom{n}{k}\right\}=\binom{n}{\lceil k/2\rceil}$

15. $n!\sim\sqrt{2\pi n}\left(\frac{n}{e}\right)^n\left(1+\frac{1}{12n}+\frac{1}{288n^2}-\frac{139}{51840n^3}-\frac{571}{2488320n^4}+\cdots\right)$ (**Stirling series**)

16. $S(n)=c.S(n-1)+g(n)\rightarrow S(n)=c^{n-1}S(1)+\sum_{i=2}^{n}c^{n-i}g(i)$ ◁ RECORRÊNCIAS

17. $T(n)=a.T(n/b)+f(n)\rightarrow T(n)=\Theta\left(n^{\log_b^a}\right)+\sum_{i=0}^{h-1}a^i f\left(\frac{n}{b^i}\right)$ para $h=\log_b^n$

Master theorem *If* $T(n)=aT(\lceil n/b\rceil)+O(n^d)$ *for some constants* $a>0$, $b>1$, *and* $d\geq 0$, *then*: ➔
DASGUPTA,S., PAPADIMITRIOU,C. and VAZIRANI, U., Algorithms (p. 49.)

$$T(n)=\begin{cases}O(n^d) & \text{if } d>\log_b a\\ O(n^d\log n) & \text{if } d=\log_b a\\ O(n^{\log_b a}) & \text{if } d<\log_b a\end{cases}$$

18. Equação homogênea característica:

$$\boxed{a_0T(n)+a_1T(n-1)+a_2T(n-2)+\ldots+a_kT(n-k)=0}$$

Raízes distintas: $r_1\neq r_2\neq r_3\ldots\neq r_p\rightarrow T(n)=c_1r_1^N+c_2r_2^N\ldots c_pr_p^N$

Raízes múltiplas: $r_1=r_2=r_3\ldots=r_p\rightarrow T(n)=c_1r_1^N+c_2Nr_2^N\cdots c_pN^{P-1}r_p^N$

Raízes Complexas Distintas: $r=a\pm bi\rightarrow T(n)=c.p^N$ onde $p=\sqrt{a^2+b^2}$

Raízes complexas múltiplas: $T(n)=c_1p^N+c_2Np^N$ onde $p=\sqrt{a^2+b^2}$