

Series

→ Arithmetic Progression (diff: $T_2 - T_1 = T_4 - T_3 = T_n - T_{n-1}$)

$$T_n = a + (n-1)d$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

→ Geometric Progression (common ratio = $\frac{T_2}{T_1} = \frac{T_3}{T_2} = \frac{T_n}{T_{n-1}}$)

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$S_{\infty} = \frac{a}{1-r} \quad \text{when } r < 1$$

→ Binomial expansion

$$\text{ex. } \left[2x + \frac{a}{x^2} \right]^5$$

$$\begin{aligned} & \left[\begin{matrix} 5 \\ 0 \end{matrix} \right] (2x)^5 + \left[\begin{matrix} 5 \\ 1 \end{matrix} \right] (2x)^4 \left[\frac{a}{x^2} \right] + \left[\begin{matrix} 5 \\ 2 \end{matrix} \right] (2x)^3 \left[\frac{a}{x^2} \right]^2 + \left[\begin{matrix} 5 \\ 3 \end{matrix} \right] (2x)^2 \left[\frac{a}{x^2} \right]^3 \\ & + \left[\begin{matrix} 5 \\ 4 \end{matrix} \right] (2x) \left[\frac{a}{x^2} \right]^4 + \left[\begin{matrix} 5 \\ 5 \end{matrix} \right] \left[\frac{a}{x^2} \right]^5 \end{aligned}$$