1. Arithmetic Series:

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

2. Geometric Series (Finite):

$$\sum_{i=0}^{n-1} ar^i = \frac{a(1-r^n)}{1-r} \quad \text{for} \quad |r| \neq 1$$

3. Sum of Squares:

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} = O(n^3)$$

4. Sum of Cubes:

$$\sum_{i=1}^{n} i^3 = \left(\frac{n(n+1)}{2}\right)^2 = O(n^4)$$

5. Harmonic Series:

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

6. Logarithmic Sum:

$$\sum_{i=1}^{n} \log i = O(n \log n)$$

7. Sum of Exponentials:

$$\sum_{i=0}^{n-1} a^i = \frac{a^n - 1}{a - 1} \quad \text{for} \quad a > 1$$

8. Telescoping Series:

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

9. **Sum of $i \log i$:**

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

10. **Geometric Series (Infinite):**

$$\sum_{i=0}^{\infty} ar^i = \frac{a}{1-r} \quad \text{for} \quad |r| < 1$$