# Arithmetic progression

\ a_n = a_1 + (n - 1)d,

\ a_n = a_m + (n - m)d.

 S_n=\frac{n}{2}[ 2a_1 + (n-1)d].

 S_n=\frac{n(a_1 + a_n)}{2}

# Summation

\sum_{i=m}^n 1 = n+1-m \,

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

\sum_{i=0}^n i^2 = \frac{n(n+1)(2n+1)}{6} = \frac{n^3}{3} + \frac{n^2}{2} + \frac{n}{6} )

\sum_{i=0}^n i^3 = \left(\frac{n(n+1)}{2}\right)^2 = \frac{n^4}{4} + \frac{n^3}{2} + \frac{n^2}{4} = \left[\sum_{i=1}^n i\right]^2 \,

\sum_{i=0}^n i^4 = \frac{n(n+1)(2n+1)(3n^2+3n-1)}{30} = \frac{n^5}{5} + \frac{n^4}{2} + \frac{n^3}{3} - \frac{n}{30} \,

\sum_{i=m}^{n-1} a^i = \frac{a^m-a^n}{1-a}

\sum_{i=0}^{n-1} a^i = \frac{1-a^n}{1-a}

\sum_{i=0}^n {n \choose i} = 2^n \,

\sum_{i=1}^{n} i{n \choose i} = n2^{n-1}

\sum_{i=0}^{n} {i \choose k} = {n+1 \choose k+1} \,

\sum_{i=0}^n {n \choose i}a^{(n-i)} b^i=(a + b)^n

\sum_{i=0}^n {m+i-1 \choose i} = {m+n \choose n} \,

a + ar + a r^2 + a r^3 + \cdots + a r^{n-1} = \sum_{k=0}^{n-1} ar^k= a \, \frac{1-r^{n}}{1-r},

# Taylor series

 \sum_{n=0} ^ {\infty} \frac {f^{(n)}(a)}{n!} \, (x-a)^{n}