Series

$$1+2+4+8+16+32 = \sum_{i=0}^{5} 2^i$$

$$\frac{1}{3} - 1 + 3 - 9 + 27 = \sum_{p=-1}^{3} (-1)^{p-1} 3^p$$

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} = \sum_{k=1}^{4} (\frac{1}{2})^k$$

$$log1 + 2 \cdot log2 + 3 \cdot log3 + \ldots + n \cdot logn = \sum_{j=1}^{n} j \cdot logj$$

$$\begin{aligned} 1+2+3+\ldots+n &= \sum_{i=1}^{n} i \\ &= \frac{n(n+1)}{2} \end{aligned}$$

$$\begin{aligned} 1+2^2+3^2+\ldots+n^2 &= \sum_{i=1}^{n} i^2 \\ &= \frac{n(n+1)(2n+1)}{6} \end{aligned}$$

$$\begin{aligned} 1+2^3+3^3+\ldots+n^3 &= \sum_{i=1}^{n} i^3 \\ &= (\frac{n(n+1)}{2})^2 \end{aligned}$$

$$\begin{aligned} 2^0+2^1+2^2+\ldots+2^n &= \sum_{i=0}^{n} 2^i \\ &= \frac{2^{n+1}-1}{2-1} \end{aligned}$$

$$\begin{aligned} 1+2+3+\ldots+k^2 &= \sum_{i=1}^{k^2} i \\ &= \frac{k^2(k^2+1)}{2} \end{aligned}$$

$$\begin{aligned} 1+2^2+3^2+\ldots+p^5 &= \sum_{i=1}^{p^{\frac{5}{2}}} i \\ &= \frac{(p^{\frac{5}{2}})\cdot(p^{\frac{5}{2}}+1)}{2} \end{aligned}$$

$$\begin{aligned} \sum_{i=-5}^{k} i^3 &= \sum_{i=-5}^{-1} i^3 + \sum_{i=0}^{k} i^3 \\ &= (\frac{(k)(k+1)}{2})^2 - \sum_{i=1}^{5} i^3 \\ &= (\frac{(k)(k+1)}{2})^2 - (\frac{(5)(6)}{2})^2 \end{aligned}$$

$$\begin{aligned} \sum_{i=10}^{m} 5^i &= \sum_{i=0}^{m} 5^i - \sum_{i=0}^{9} 5^i \\ &= \frac{5^{m+1}-1}{5-1} - \frac{5^{10}-1}{5-1} \end{aligned}$$

$$\begin{aligned} \sum_{j=0}^{n}\sum_{i=1}^{j} 6 &= \sum_{j=0}^{n} 6\cdot j \\ &= 6\cdot\frac{(n)\cdot(n+1)}{2} \\ &= 3\cdot(n)\cdot(n+1) \end{aligned}$$

$$\begin{aligned} \sum_{k=-5}^{p}\sum_{i=1}^{j} 4 &= \sum_{k=-5}^{p} 4\cdot j \\ &= 4\cdot j\cdot(p+5+1) \\ &= 4\cdot j\cdot(p+6) \end{aligned}$$

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\begin{aligned}
\sum_{k=-10}^{200}(2k^3+8) &= \sum_{k=-10}^{200}2k^3+\sum_{k=-10}^{200}8 \\
&= \sum_{k=-10}^{-1}2k^3+\sum_{k=0}^{200}2k^3+8(211) \\
&= 2(\frac{(200)(201)}{2})^2-2(\frac{(10)(11)}{2})^2+8(211)
\end{aligned}
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