Summation Formulas

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2} \quad , \quad \sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} \quad , \quad \sum_{i=1}^{n} i^3 = \left(\frac{n(n+1)}{2}\right)^2$$

Example:

Find the value of the sum $\sum_{j=1}^{32} \left(2j^3 + 3j^2 - 7j + 6 \right)$.

$$= 2\sum_{j=1}^{32} j^3 + 3\sum_{j=1}^{32} j^2 - 7\sum_{j=1}^{32} j + \sum_{j=1}^{32} 6$$

$$= 2\left[\frac{32(33)}{2}\right]^2 + 3\left[\frac{32(33)(65)}{6}\right] + \frac{32(33)}{2} + 32 \cdot 6$$

$$= 16 \cdot (32)(33)^2 + 16(33)(65) + 16(33) + 32 \cdot 6$$

$$= 592,608$$