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