Number 6: Find the difference between the sum of the squares of the first one hundred natural numbers and the square of the sum.

Sum of the first n integers:

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

Sum of the square of the first n integers:

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

Difference of the square of the sum of the first n integers and the sum of the squares of the first n integers:

$$\left(\frac{n(n+1)}{2}\right)^2 - \frac{n(n+1)(2n+1)}{6}$$

Simplified:

$$\frac{3n^4 + 2n^3 - 3n^2 - 2n}{12}$$