

$$\begin{aligned}
 \sum_{i=1}^n (x - i - \overline{x})^2 &= \sum_{i=1}^n (x_i^2 - 2x_1\overline{x} + \overline{x})^2 \\
 &= \sum_{i=1}^n x_1^2 - \sum_{i=1}^n 2x_i\overline{x} + \sum_{i=1}^n \overline{x}^2 \\
 &= \sum_{i=1}^n x_1^2 - 2\overline{x} \sum_{i=1}^n x_i + \overline{x}^2 \sum_{i=1}^n 1
 \end{aligned}$$