

Example Calculate $\sum_{i=1}^7(2i + 3) - \sum_{k=2}^6(k + 4)$

$$\begin{aligned}
 \sum_{i=1}^7(2i + 3) - \sum_{k=2}^6(k + 4) &= \sum_{i=1}^7(2i + 3) - \sum_{i=1}^5(i + 5) \text{ Let } i=k-1 \text{ in the 2nd sum} \\
 &= \underbrace{\sum_{i=1}^5(2i + 3) - \sum_{i=1}^5(i + 5)}_{} + \sum_{i=6}^7(2i + 3) \\
 &= \sum_{i=1}^5 2i + 3 - i - 5 + \sum_{i=6}^7(2i + 3) \\
 &= \sum_{i=1}^5 i - 2 + \sum_{i=6}^7(2i + 3) \\
 &= \sum_{i=1}^5 i - \sum_{i=1}^5 2 + \sum_{i=6}^7(2i + 3) \\
 &= \frac{5 \cdot 6}{2} - 2 \cdot 5 + (2 \cdot 6 + 3) + (2 \cdot 7 + 3) = 37
 \end{aligned}$$