

We start with spookywooky's formula.

$$\text{ans} = \sum_{i=k}^{n+1} \max(i) - \min(i) + 1. \quad (1)$$

$$\max(i) = \frac{(2 * n - i + 1)i}{2}. \quad (2)$$

$$\min(i) = \frac{(i - 1)i}{2}. \quad (3)$$

Thus,

$$\text{ans} = \sum_{i=k}^{n+1} -i^2 + (n + 1)i + 1 \quad (4)$$

$$= - \sum_{i=k}^{n+1} i^2 + (n + 1) \sum_{i=k}^{n+1} i + \sum_{i=k}^{n+1} 1 \quad (5)$$

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

To calculate the first term,

$$\sum_{i=k}^{n+1} i^2 = \sum_{i=0}^{n+1} i^2 - \sum_{i=0}^{k-1} i^2 \quad (7)$$

where

$$\sum_{i=0}^n = \frac{n(n + 1)(2n + 1)}{6}. \quad (8)$$

Plug in and simplify.

$$\text{ans} = \frac{1}{6} (2k^3 - 3k^2n - 6k^2 + 3kn - 2k + n^3 + 3n^2 + 8n + 12). \quad (9)$$