$S(k) = S(k-1) + (k-1)$

Given $S(1) = 0$

$n = 1; S(k) = S(k-1) + (k-1)$

$S(1) = S(1-1) + (1-1) = 0 + 0 = 0$

$n = 2; S(k) = [S(k-2) + (k-2)] + (k-1)$

$S(2) = S(2-2) + (2-2) + (2-1) = 0 + 0 + 1 = 1$

$n = 3; S(k) = [S(k-3) + (k-3)] + (k-2) + (k-1)$

$S(3) = S(3-3) + (3-3) + (3-2) + (3-1) = 0 + 0 + 1 + 2 = 3$

$n = 4; S(k) = [S(k-4) + (k-4)] + (k-3) + (k-2) + (k-1)$

$S(4) = S(4-4) + (4-4) + (4-3) + (4-2) + (4-1) = 0 + 0 + 1 + 2 + 3 = 6$

$S(k) + 0 + 1 + \cdots + (k-1)$

Sum of first n terms given by $n = k - 1$, so $\frac{n(n+1)}{2} = \frac{(k-1)(k-1+1)}{2} = \frac{k(k-1)}{2}$