Some useful Summation Formula:

Sum	closed form
① $\sum_{k=0}^{n} ar^k \ (r \neq 0)$	$\frac{ar^{n+1} - a}{r-1}, r \neq 1$
② $\sum_{k=1}^{n} k$	$\frac{n(n+1)}{2}$
③ $\sum_{k=1}^{n} k^2$	$\frac{n(n+1)(2n+1)}{6}$
④ $\sum_{k=1}^{n} k^3$	$\frac{n^2(n+1)^2}{4}$
⑤ $\sum_{k=0}^{\infty} x^k, \ \lvert x \rvert < 1$	$\frac{1}{1-x}$
⑥ $\sum_{k=1}^{\infty} kx^{k-1}, \ \lvert x \rvert < 1$	$\frac{1}{(1-x)^2}$

Eg: Find $\sum_{k=50}^{100} k^2$

Soln $\sum_{k=1}^{100} k^2 = \sum_{k=1}^{49} k^2 + \sum_{k=50}^{100} k^2$

So $\sum_{k=50}^{100} k^2 = \sum_{k=1}^{100} k^2 - \sum_{k=1}^{49} k^2$

$\Rightarrow \sum_{k=50}^{100} k^2 = \frac{100 \cdot 101 \cdot 201}{6} - \frac{49 \cdot 50 \cdot 99}{6} = 338350 - 40425$

$= 297,925$ //

Eg: What is the value of $\sum_{s \in \{0,2,4\}} s$?

Sol^{n} Because $\sum_{s \in \{0,2,4\}} s$ represents the sum of the values of s for all the members of the set $\{0,2,4\}$, it follows that

$$\sum_{s \in \{0,2,4\}} s = 0+2+4 = 6 \text{ //}$$