The Sum of the First *n*-terms of a Geometric Series (with index starting at $i = 0$) is given by

$$\sum_{i=0}^{n-1} ar^i = a + ar + ar^2 + \cdots + ar^{n-1}$$
$$= \frac{a\left(1 - r^n\right)}{1 - r}$$

* Note: If the index starts at zero, then the first *n*-terms ends with the exponent of $n - 1$.
** Note: The exponent in the fraction is always *one more* than the exponent of the final term.

The Sum of an infinite Geometric Series with initial term ar^k where $k > 0$

$$\sum_{i=k}^{\infty} ar^i = ar^k + ar^{k+1} + ar^{k+2} + \cdots$$
$$= ar^k\left(1 + r + r^2 + r^3 + \cdots\right)$$
$$= ar^k \sum_{i=0}^{\infty} r^i$$
$$= ar^k\left(\frac{1}{1 - r}\right)$$
$$= \frac{ar^k}{1 - r}$$
$$= \frac{\text{first term}}{1 - \text{common ratio}}$$