Review: Formula for Geometric Series

Formula: $\sum_{j=0}^{k} r^j = 1+r+r^2+\ldots+r^k = \frac{r^{k+1}-1}{r-1}$

proof:

Let $x = \sum_{j=0}^{k} r^j = 1+r+r^2+\ldots+r^k$

Trick: Compare rx with x

$$rx = r+r^2+\ldots+r^k+r^{k+1}$$
$$-\ x = 1+r+r^2+\ldots+r^k$$

$$rx-x = (r-1)x = r^{k+1}-1$$

$$x = \frac{r^{k+1}-1}{r-1}$$

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$$\sum_{j=0}^{5} 2^j = 1 + 2 + 4 + 8 + 16 + 32 = \frac{2^6 - 1}{2 - 1} = \frac{64 - 1}{1} = 63$$

$$r = 2 \quad k = 5$$

$$\sum_{j=0}^{4} 3^j = 1 + 3 + 9 + 27 + 81 = \frac{3^5 - 1}{3 - 1} = \frac{243 - 1}{2} = \frac{242}{2} = 121$$

$$r = 3 \quad k = 4$$