

Complex Number $S_{4n} = 0$

$$1+i^2+i^3+i^4 = 0$$

$$= i + (-1) + (-i) + 1 = 0 \quad \Rightarrow S_4 = 0$$

Calculate $S_8 = ?$

$$i^8 = (i^4)^2 = (1)^2 = 1$$

$$i^4 = i^8 = i^{12} = 1$$

$$S_n = a_1 \frac{g^n - 1}{g - 1}, S_8 = ? \text{ We know } i^8 = 1$$

$$S_8 = i \frac{i^8 - 1}{i - 1} = \frac{i}{i - 1} (i^8 - 1) = \frac{i}{i - 1} \cdot 0 = 0$$

$S_{12} = ?$

$$i^{12} = ? \quad i^{12} = (i^4)^3 = (1)^3 = 1$$

$$i^{12} = 1$$

$$S_{12} = \frac{(i)^{12} - 1}{i - 1} \cdot i = 0$$