$$\omega_0, \omega_1, \ldots, \omega_{71} = \sqrt[72]{1}$$

$$\omega_k = \cos\frac{2k\pi}{72} + \imath\sin\frac{2k\pi}{72}$$

$$\omega_0^{389} + \omega_1^{389} + \cdots + \omega_{71}^{389} = ?$$

$$\omega_0^{389} + \omega_1^{389} + \cdots + \omega_{71}^{389} = \sum_{i=0}^{71} \omega_i^{389}$$

$$\omega_k \in \mathbb{C}$$

$$\implies \omega_1^k = \cos\frac{2k\pi}{72} + \imath\sin\frac{2k\pi}{72} = \omega_k$$

$$\implies \omega_0^{389} + \omega_1^{389} + \cdots + \omega_{71}^{389} = \omega_0^{389} + \omega_1^{389} + \omega_1^{389\times2} + \cdots + \omega_{71\times71}^{389}$$

$$\omega_k = \omega_1^k \implies \sum_{i=0}^{71} \omega_i^{389} = \frac{\omega_1^{72} - 1}{\omega_1 - 1}$$