Let $\omega \neq 1$, be a cube root of unity and S be the set of all non-singular matrices of the form $\begin{bmatrix} 1 & a & b \\ \omega & 1 & c \\ \omega^2 & \omega & 1 \end{bmatrix}$ where each of $a, b, \& c$ is either ω or ω^2.

Then number of distinct matrices in set S is:

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A 2

B 6

C 4

D 8

Solution:

$$\begin{vmatrix} 1 & a & b \\ \omega & 1 & c \\ \omega^2 & \omega & 1 \end{vmatrix} \neq 0$$

$$1 - a\omega - c\omega + ac\omega^2 \neq 0$$

$$\Rightarrow (1 - a\omega)(1 - c\omega) \neq 0 \Rightarrow a \neq \frac{1}{\omega} \,\&\, c \neq \frac{1}{\omega}$$

So, $a = c = \omega$, while b can take ω or ω^2

Number of matrices = 2

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