

The number is irrational. To prove this, assume that $\log_{28} 98$ is rational. Then there are relatively prime positive integers p, q with

$$\log_{28} 98 = \frac{p}{q}.$$

This last statement is equivalent to

$$28^{p/q} = 98, \quad \text{from which} \quad 28^p = 98^q.$$

It follows that

$$2^{2p} 7^p = 2^q 7^{2q}.$$

By the Fundamental Theorem of Arithmetic, it must then be the case that $2p = q$, and $p = 2q$. This can be the case if and only if $p = q = 0$, contradicting our choice of p and q . Hence, $\log_{28} 98$ is irrational.