

$\frac{9 + 9^n}{8^n} > \frac{9^n}{8^n} = \left(\frac{9}{8}\right)^n$ for all $n \geq 1$, so $\sum_{n=1}^{\infty} \frac{9 + 9^n}{8^n}$ diverges by comparison with the divergent geometric series $\sum_{n=1}^{\infty} \left(\frac{9}{8}\right)^n$.