

$\sum_{n=1}^{\infty} \frac{(-7)^{n-1}}{8^n} = \frac{1}{8} \sum_{n=1}^{\infty} \left(-\frac{7}{8}\right)^{n-1}$. The latter series is geometric with $a = \frac{1}{8}$ and ratio $r = -\frac{7}{8}$. Since $|r| = \frac{7}{8} < 1$, it converges to $\frac{1/8}{1 - (-7/8)} = \frac{1}{15}$. Thus, the given series converges to $\frac{1}{15}$.