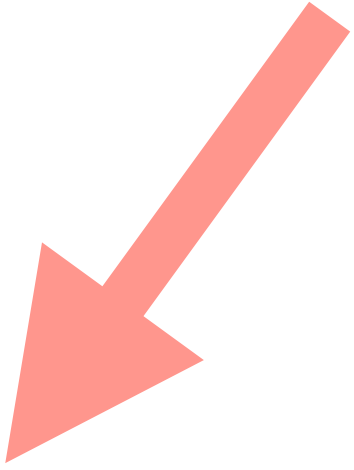
example

geometric series

$$\text{second term} = ar \implies r = \frac{\text{term 2}}{\text{term 1}} = \frac{10/4}{-10} = \frac{-1}{4}$$

first term $= a$



geometric series

example

Find the sum of the series $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n 10}{4^{n-1}}$

- We identify the values of a and r
- The series expands to

$$\sum_{n=1}^{\infty} \frac{(-1)^n 10}{4^{n-1}} = -10 + \frac{10}{4} - \frac{10}{16} + \cdots$$

first term = a

second term = ar $\implies$ $r = \dfrac{\text{term 2}}{\text{term 1}} = \dfrac{10/4}{-10} = \dfrac{-1}{4}$

- Double check: $ar^{n-1} = \dfrac{(-1)^n 10}{4^{n-1}}$
- Since $|r| < 1$ $\implies$ $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n 10}{4^{n-1}} = \frac{a}{1-r} = \frac{-10}{1-\frac{(-1)}{4}} = -8$

harmonic series