A **series** is an infinite sum.

A few examples:

$\displaystyle\sum_{k=0}^{\infty} \frac{27k-42}{k^3+37}$	*is* a series
$\displaystyle\sum_{j=3}^{100000} \left(\frac{4}{5}\right)^j$	is *not* a series
$3+7+42-16+1000-\pi+\ldots$	*is* a series
$\displaystyle\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}$	is *not* a series

Example: $\displaystyle\sum_{k=0}^{\infty}\left(\frac{1}{2}\right)^{k}$ is a geometric series, with $r=\dfrac{1}{2}$.

The associated **sequence of terms** $\{a_k\}$ is

$$\left\{\left(\frac{1}{2}\right)^{k}\right\}_{k=0}^{\infty}=\{1,\frac{1}{2},\frac{1}{4},\frac{1}{8},\frac{1}{16},\ldots\}$$

The associated **sequence of partial sums** S_n is

$$\begin{aligned}\{1,1+\frac{1}{2},1+\frac{1}{2}+\frac{1}{4},1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8},& \\ 1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16},\ldots\} \quad &= \quad \{1,\frac{3}{2},\frac{7}{4},\frac{15}{8},\frac{31}{16},\ldots\}\end{aligned}$$

For each series below:

(a) Find a_2 and a_3; S_2 and S_3.

(b) Does the series converge or diverge? If it converges, find the value to which it converges.

1. $\displaystyle\sum_{k=0}^{\infty} \frac{4}{3^k}$

2. $\displaystyle\sum_{k=0}^{\infty} \frac{2^k}{(-5)^k}$