- The sequence $a_n = \frac{1}{n}$ converges to zero. We either write
$$\lim_{n\to\infty} a_n = 0$$
or plug in our specific a_n to write
$$\lim_{n\to\infty} \frac{1}{n} = 0.$$
We can also write
$$a_n \to 0$$
or write
$$\frac{1}{n} \to 0.$$
However, do not write
$$\lim_{n\to\infty} a_n \to 0$$
or
$$\lim_{n\to\infty} \frac{1}{n} \to 0.$$

- By contrast, the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n}$ is the harmonic series, and diverges. There are several ways to show this:
  - It is possible to take a look at the sequence of partial sums s_n. One can note that $s_2 \geq 1$ and $s_4 \geq 2$ and $s_8 \geq 3$ and $s_{16} \geq 4$ and so on. It is probably easier to do one of the other things below:
  - The function $f(x) = \frac{1}{x}$ is continuous, positive, and decreasing on $[1, \infty)$. Then
$$\int_1^{\infty} \frac{1}{x}\,dx = \lim_{t\to\infty} \int_1^t \frac{1}{x}\,dx = \lim_{t\to\infty} (\ln|t| - \ln|1|) = \infty$$
since the integral $\displaystyle\int_1^{\infty} \frac{1}{x}\,dx$ diverges, the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n}$ diverges by the Integral Test
  - $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n}$ is a p-series with $p = 1$. Since $p \leq 1$, the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n}$ diverges.