51 One can either add the terms directly or apply the formula $S_n = a_1\left(\frac{1-r^n}{1-r}\right)$. We will apply the formula. In this sequence $a_1 = 1$ and $r = \frac{1}{3}$.

$$S_2 = 1\left(\frac{1-(1/3)^2}{1-(1/3)}\right) = \frac{4}{3} \approx 1.3333; \; S_4 = 1\left(\frac{1-(1/3)^4}{1-(1/3)}\right) = \frac{40}{27} \approx 1.4815$$

$$S_8 = 1\left(\frac{1-(1/3)^8}{1-(1/3)}\right) \approx 1.49977; \; S_{16} = 1\left(\frac{1-(1/3)^{16}}{1-(1/3)}\right) \approx 1.49999997$$

The sum of the infinite series $\sum_{n=1}^{\infty}\left(\frac{1}{3}\right)^{k-1}$ is given by $S = \frac{a_1}{1-r} = \frac{1}{1-\frac{1}{3}} = \frac{3}{2} = 1.5$.

As n increases, the partial sums S_2, S_4, S_8, and S_{16} become closer and closer to the value of 1.5.