

Skills Check Find the sum of the first 15 terms of the geometric sequence 100, 50, 25,.... ¹

If the sum of a finite geometric sequence involves the first term a_1 and the common ratio r , then

$$S_n = \frac{a_1(1 - r^n)}{1 - r}.$$

We are given a geometric sequence with $a_1 = 100$, so our next task is to find the common ratio. Dividing one term by the previous term we have $\frac{50}{100} = 0.5$ and, just to be sure, $\frac{25}{50} = 0.5$.

The common ratio is $r = 0.5$ and the first term is $a_1 = 100$. Now we can use the formula to find the sum of the first 15 terms.

$$\begin{aligned} S_n &= \frac{a_1(1 - r^n)}{1 - r} \\ S_{15} &= \frac{100(1 - 0.5^{15})}{1 - 0.5} \\ &= \frac{100(1 - 0.5^{15})}{0.5} \\ &\approx \frac{99.99694824}{0.5} \\ &\approx 199.9938965 \end{aligned}$$

And my calculator will give this result in fraction form, $\frac{819,175}{4096}$.

The sum of the first 15 terms of the geometric sequence 100, 50, 25, ... is $\frac{819,175}{4096}$ or approximately 199.9938965.

¹Harshbarger/Yocco, *College Algebra In Context*, 5e, p. 625 #10.