

**Skills Check** Evaluate the sum  $\sum_{i=1}^5 \left(\frac{1}{2}\right)^i$ .<sup>1</sup>

The index,  $i$ , on this summation tells us that we will be finding the sum of the first five terms of the sequence. Term  $i = 1$  is our starting point and the 5th term is where we will stop the summation.

$$\begin{aligned}\sum_{i=1}^5 \left(\frac{1}{2}\right)^i &= \left(\frac{1}{2}\right)^1 + \left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^3 + \left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^5 \\ &= \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} \\ &= \frac{16}{32} + \frac{8}{32} + \frac{4}{32} + \frac{2}{32} + \frac{16}{32} \\ &= \frac{31}{32}\end{aligned}$$

$$\sum_{i=1}^5 \left(\frac{1}{2}\right)^i = \frac{31}{32}$$

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<sup>1</sup>Harshbarger/Yocco, *College Algebra In Context*, 5e, p. 625 #16.