FIND THE SPECIFIC TERM IN A GEOMETRIC SEQUENCE

To do this, the formula is $\{S_n\} = \{a_1 \cdot r^{n-1}\}$.

Example 3

Find the fourth term of the sequence with $a_1 = 5$, $r = -2$.

$$\{S_4\} = \{a_1 \cdot r^{n-1}\} = \{5 \cdot (-2)^{4-1}\}$$
$$= \{5 \cdot (-2)^3\} = \{5 \cdot (-8)\} = \{-40\}$$

The solution shows the fourth term as $(5)(-2)(-2)(-2)$ or $5(-2)^3$. The exponent 3 is one less than the term we are seeking. See how $\{S_n\} = \{a_1 \cdot r^{n-1}\}$ makes sense?

Example 4

Find the 10th term of the sequence with {1, 2, 4, 8, . . . }.

$$a_1 = 1 \qquad r = \frac{4}{2} = 2$$

$$\{S_{10}\} = \{a_1 \cdot r^{n-1}\} = \{1 \cdot (2)^{10-1}\} = \{2^9\} = 512$$

Practice Problems 2

Find the specific term requested in the sequence. If you don't already know how to find powers larger than 2 with your calculator, this is a good time to find out.

1. Find the 9th term of {2, –4, 8}.
2. Find the 20th term of {1, 3, 9}.
3. Find the 12th term of $\{-3, 1, -\frac{1}{3}\}$.
4. Find the 7th term of $\{\frac{1}{1000}, \frac{1}{100}, \frac{1}{10}\}$.

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The formula for finding the sum or series of a geometric sequence is $\frac{a_1(1-r^n)}{1-r}$.

Example 6

Use the formula to compute the series.

$$\sum_{k=1}^{5} \{3^k\} \Rightarrow a_1 = 3,\ a_2 = 9,\ r = 3,\ n = 5$$

$$\Rightarrow \frac{3(1-3^5)}{1-3} = \frac{3(1-243)}{-2} = \frac{3(-242)}{-2} = 3(121) = 363$$

Example 7

Solve the series by adding the terms of the sequence. Then use the formula and compare the solutions

$$\sum_{k=1}^{8} \{2^k\} = 2 + 4 + 8 + 16 + 32 + 64 + 128 + 256 = 510$$

$$\Rightarrow a_1 = 2,\ a_2 = 4,\ r = 2,\ n = 8$$

$$\Rightarrow \frac{2(1-2^8)}{1-2} = \frac{2(1-256)}{-1} = -2(-255) = 510$$

Practice Problems 3

Compute the series.

1. $\sum_{k=1}^{5} \{2^{k-1}\}$

2. $\sum_{b=1}^{5} \{10^{2-b}\}$

3. $\sum_{M=1}^{5} \{(\frac{2}{3})^{M-2}\}$