11.4 Geometric Sequences

A geometric sequence is a sequence in which the ratio of any term to the previous term is constant. This constant ratio is called the common ratio and is denoted by r.

Decide whether each sequence is geometric. If so, identify the common ratio and give the next 3 terms.

- 1. 1, 2, 6, 24, 120,... 2. 81, 27, 9, 3, 1,... not geometric
- 3. 4,-8, 16,-32,... geometric 4=-1
- geometric トニコ
- **4.** 3, 9, -27, -81, 243,... not geometric

List the first four terms of each geometric sequence.

5.
$$t_1 = -2$$

 $t_n = 4t_{n-1}$
 $t_2 = 4t_1$
 $t_2 = 4(-2) = -8$
 $t_3 = 4t_2$
 $t_3 = 4(-8) = -32$
 $t_4 = 4t_3$
 $t_4 = 4(-32) = -128$

6.
$$t_1 = -1$$

 $t_n = -0.2t_{n-1}$
 $t_2 = -0.2t_1$
 $t_2 = -0.2(-1) = 0.2$
 $t_3 = -0.2t_2$
 $t_3 = -0.2(0.2) = -0.04$
 $t_4 = -0.2t_3$
 $t_4 = -0.2(-0.04) = 0.008$

nth Term of a Geometric Sequence

$$t_n = t_1 r^{n-1}$$

7. Find the eighth term of the sequence defined by $t_1 = 2.5$ and $t_n = -4t_{n-1}$. $t_0 = 2.5(-4)^{8-1}$

4=-40,960

8. Find t_9 of a geometric sequence if t_1 = 144 and $r = \frac{1}{2}$. $t_9 = 144 \left(\frac{1}{2}\right)^{9-1}$ $t_9 = \frac{4}{16}$

9. Find t_6 in the geometric sequence that includes

$$t_{3} = 150 \text{ and } t_{5} = 3750. \quad n-1$$

$$t_{n} = t_{1} \quad r$$

$$k = 3$$

$$t_{n} = t_{k} \quad r$$

$$t_{5} = t_{3} \quad r$$

$$t_{6} = t_{3} \quad r$$

$$t_{6} = t_{3} \quad r$$

$$t_{6} = 150(5)^{3}$$

$$t_{150} = 150r^{2}$$

$$t_{150} = 150(-5)^{3}$$

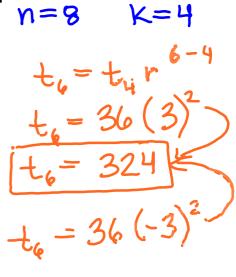
$$t_{150} = 150(-5)^{3}$$

$$t_{150} = 150(-5)^{3}$$

$$t_{150} = 150(-5)^{3}$$

10. Find t_6 in the geometric sequence that includes

$$t_4 = 36 \text{ and } t_8 = 2916_k$$
 $t_n = t_k r$
 $t_8 = t_4 r^{8-4}$
 $t_8 = t_4 r^{8-4}$



11. Write an explicit formula for the *n*th term of the geometric sequence 30, 10, $3\frac{1}{3}$, $1\frac{1}{9}$,... $r = \frac{1}{3}$

$$t_{n} = t_{1}r^{n-1}$$

$$t_{n} = 30(\frac{1}{3})^{n-1}$$

The terms between any two nonconsecutive terms of a geometric sequence are called the geometric means.

12. Find the three geometric means between 6 and 96.

$$6 = \frac{\pm 12}{xr} = \frac{24}{xr} = \frac{\pm 48}{xr} = 96$$

$$6r^{4} = 96$$

$$6r^{4}$$

13. Find the three geometric means between 324 and 4.

$$324 \pm 108 \qquad 36 \pm 12 + 4$$

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