10-3A Geometric Sequences

- *students will use and find terms of a geometric sequence*
- *A.SSE.4*

definition of a geometric sequence: a sequence in which each term after the first is found by multiplying the previous term by a constant called the common ratio.

common ratio (r): divide any term by the previous term. $r = \frac{a_4}{a_3}$

nth term of a geometric sequence: the nth term, a_n, of a geometric sequence with first term a_1 and common ratio r is given by the formula: $a_n = a_{n-1}r$ or $a_n = a_1 r^{n-1}$

$(n-1)\cdot d$

geometric mean(s): the missing term(s) between two nonconsecutive terms in a geometric sequence.

$a_1, \_\_\_, a_n$

$a_1 = 3$ (+3)

$a_2 = 6$

$a_3 = 9$

$a_n = a_1 + (n-1)d$

$a_n = 3 + (n-1)3$

$3 + 3n - 3$

$3n$

$\sum_{n=1}^{333} 3n$

Examples

Find the nth term of the geometric sequence.

1. $a_4 = 10, n = 5, r = \frac{1}{2}$

$a_5 = a_4 \cdot r$

$a_5 = 10\left(\frac{1}{2}\right)$

$a_5 = 5$

2. $a_6 = 729, n = 9, r = 3$

$n = 9 - 6 + 1$

$n = 4$

729, ___, ___, ___, ___

a_6 a_1 a_n

$a_n = a_1 \cdot r^{n-1}$

$a_4 = 729 \cdot 3^{4-1}$

$a_4 = 729 \cdot 3^3$

$a_4 = 729 \cdot 27$

$a_4 = 19683$

3. Find the 3 geometric means between 3.12 and 49.92.

3.12, ___, ___, ___, 49.92

a_1 a_n

$n = 5$

$\pm 6.24, 12.48, \pm 24.96$

$a_n = a_1 \cdot r^{n-1}$

$49.92 = 3.12 \cdot r^{5-1}$

$\frac{49.92}{3.12} = \frac{3.12 \cdot r^4}{3.12}$

$\sqrt[4]{16} = \sqrt[4]{r^4}$

$r = \pm 2$

$a_1 = 5$

$r = 2$

$a_n = a_1 \cdot r^{n-1}$

$a_n = 5 \cdot 2^{n-1}$

$9 = 3^{n-1}$

$3^2 = 3^{n-1}$

$\log 5 = \log 5^{n-1}$

$0 = 5x + 4$

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