11.3 Geometric Sequences

std. 22.0

common ratio $r = \frac{a_2}{a_1} = \frac{a_3}{a_2}$

March 5

ex. 1 **Given the sequence 1, 3, 9, 27, . . .**

$\times 3 \quad \times 3 \quad \times 3 = r$

$a_1 = 1$

$a_2 = 1 \cdot 3^1$

$a_3 = 1 \cdot 3^2$

$a_4 = 1 \cdot 3^3$

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

***n*th term of a geometric sequence:** $a_n = a_1 \cdot r^{n-1}$

ex. 2 **Given the sequence 5, 2, 0.8, 0.32, . . .** $r = \frac{2}{5} = .4$

(x.4)

a) write a rule for the *n*th term

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

$a_n = 5(.4)^{n-1}$

b) find a_8

$a_8 = 5(.4)^7$

$a_8 = 0.008192$

ex. 3 **In a geometric sequence, $a_4 = 3$ and $r = 3$. Write a rule for the *n*th term.**

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

$3 = a_1 \cdot 3^3$

$\frac{1}{9} = \frac{3}{27} = a_1$

$a_n = \frac{1}{9}(3)^{n-1}$

ex. 4

Two terms of a geometric sequence are $a_2 = -4$ and $a_6 = -1024$. Write a rule for the nth term.

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

$-4 = a_1 \cdot r^{2-1}$

$-1024 = a_1 \cdot r^{6-1}$

$-4 = a_1 \cdot r$

$-1024 = a_1 \cdot r^5$

$r = 4$ or $r = -4$

$-4 = a_1 \cdot 4$

$-1 = a_1$

$a_n = (-1)4^{n-1}$

$-4 = a_1 \cdot -4$

$1 = a_1$

$a_n = 1(-4)^{n-1}$

$a_n = (-4)^{n-1}$

$-1024 = \frac{-4}{r} \cdot r^5$

$-1024 = -4r^4$

$\sqrt[4]{256} = \sqrt[4]{r^4}$

$r = \pm 4$

ex. 5

Grandma Georgie gave Ryker $1 on his 1st birthday. On his 2nd birthday, she gave him $2, on his 3rd birthday she will give him $4, and so on. On which birthday should Grandma Georgie give Ryker $1024?

a_n

$1, 2, 4, \ldots, 1024$ (11th)

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

$r = 2$

$a_1 = 1$

$1024 = 1 \cdot 2^{n-1}$

$1024 = 2^{n-1}$

$2^{10} = 2^{n-1}$