

CW: 4.1.3

## Geometric Sequences

$$f(x) = a(b)^x$$

### DEFINITIONS:

**COMMON RATIO:** The ratio between the terms is the same. (The number each term is multiplied by is the same.) The variable used is x.

- Note: Sometimes it looks like division (but is written as multiplying by a fraction).

60, 30, 15, 7.5, ...  
dividing by 2 → multiplying by  $\frac{1}{2}$

Examples:

a) 1, 3, 9, 27, 81, 243, 729  
 $r = \underline{3}$

b) 4, -16, 64, -256, 1024, -4096  
 $r = \underline{-4}$

THINK  
What do you do when the multiplication pattern is not easy to see?  
Strategy: **WORK BACKWARDS** and **DIVIDE** to find it!

c) 2, 8, 32, 128...

$r = \underline{4}$

Next 3 terms: 512, 2048, 8192

d) 243, 81, 27, 9...

$r = \underline{\frac{1}{3}}$

Next 3 terms: 3, 1,  $\frac{1}{3}$

**GEOMETRIC SEQUENCE:** When the common ratio between CONSECUTIVE terms is the same we have an example of a GEOMETRIC SEQUENCE.  
(in a row: 1st, 2nd, 3rd)

### FUNCTION RULE: Geometric Sequences

common ratio  
 $f(x) = a \cdot (b)^x$   
zero term

e) 6, 12, 24, 48...  
 $\times 2$

$r = \underline{2}$

$6 \div 2$

Zero Term = 3

zero term  
 $f(x) = a \cdot b^x$   
ratio  
Write the FUNCTION RULE (equation) for the sequence.

$f(x) = 3 \cdot 2^x$

Find the 9<sup>th</sup> term. \_\_\_\_\_

$f(9) = 3 \cdot 2^9$

calculator →  $3 \cdot 2 \wedge 9$   
1536

f) 320, 160, 80, 40...  $\div 2$

$$r = \frac{1}{2}$$

$$320(2)$$

$$\text{Zero Term} = 640$$

Write the FUNCTION RULE  
(equation) for the sequence.

$$f(x) = 640 \cdot \left(\frac{1}{2}\right)^x$$

Find the 11<sup>th</sup> term. 0.3125

$$640 \cdot \left(\frac{1}{2}\right)^{11}$$

g) -3, 24, -192, 1536...

$$r = -8$$

$$\text{Zero Term} = \frac{3}{8}$$

Write the FUNCTION RULE  
(equation) for the sequence.

$$f(x) = \frac{3}{8}(-8)^x$$

Find the 6<sup>th</sup> term. 98,304

$$\frac{3}{8}(-8)^6$$

h)  $f(x) = 4(8)^x$

$$\text{Common Ratio: } 8$$

$$\text{Zero Term: } 4$$

$$\text{First Term: } \frac{32}{4 \cdot 8}$$

i)  $f(x) = 0.75(12)^x$

$$\text{Common Ratio: } 12$$

$$\text{Zero Term: } 0.75$$

$$\text{First Term: } \frac{9}{0.75 \cdot 12}$$

$$f(x) = a \cdot b^x$$

$$f(x) = -1 \cdot 4^x$$

j)  $f(x) = -4^x$

$$\text{Common Ratio: } 4$$

$$\text{Zero Term: } -1$$

$$\text{First Term: } -4$$

k) A small business earned \$21 in the first month. It quadrupled this amount each month for the next six months. How much did the business earn in the fourth month?

$$f(x) = 21 \cdot 4^x$$

$$= 21 \cdot 4^4$$

$$\$5376$$