9.3 Geometric Sequences
a. I can identify a geometric sequence and state its common ratio.
b. I can write an explicit rule for a geometric sequence.
   1. Given a term and common ratio.
   2. Given a sequence.
c. I can find the nth term of a geometric sequence.

## p. 46-47 Geometric Sequences 9.3

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Warm-up : Write the sequence in your notes

**{ 20, 14, 8, ...**

p. 46

a. Identify the common difference.

$d = -6$

b. Write the Explicit Formula

$a_n = 20 + (n-1)(-6)$

c. Find the 75th term using your Explicit Formula

$a_{75} = 20 + (75-1)(-6)$

$a_{75} = -424$

*Yesterday we learned about arithmetic sequences.*

Are the following Arithmetic sequences?
Explain why or why not.

{ 1, 2, 3, 4, 5, ... $d = 1$

{ 1, 2, 4, 8, 16, ... (multiplying 2)

Are the following Arithmetic sequences?
Explain why or why not.

{ e, 2e, 3e, 4e, 5e, ...

{ e, $e^2$, $e^3$, $e^4$, $e^5$, ...

# Geometric Sequences

p. 47

Geometric Sequence: a sequence where hdfk#whup #diwhu#wkh#1vw#lv# found by multiplying the previous term by d#frqvwdqw1

Frp p rq#Udwlr#u: the constant you multiply by to get the next whup 1#

\rx#fdq#ilqg#wkh#Frp p rq#Udwlr#e|#glylglqj#dq|#whup #q#wkh#vhtxhqfh# e|#lw#suhylrxv#whup 1##u#@ #d$_q$#2#d$_{q04}$

GEOMETRIC SEQUENCE

$$a_n = a_1(r)^{(n-1)}$$

$a_n$ = $n^{th}$ term in the sequence

$a_1$ = first term in the sequence

r = common ratio

n = # of term in the sequence

**1. Determine the next terms of the geometric sequence then write the Explicit Formula**

p. 47

{ 5, 15, 45, 135, 405, 1215, ...

$a_1 = 5$

$r = 3$

Explicit Formula

$a_n = 5 \cdot (3)^{(n-1)}$

**Use the Explicit Formula to find the 9th term**

$a_9 = 5 \cdot (3)^{(9-1)}$

$a_9 = 32,805$

**2. Determine the next terms of the geometric sequence then write the Explicit Formula**

{ -3, 9, -27, 81, -243, 729, ...

$a_1 = -3$

$r = -3$

Explicit Formula

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

**Use the Explicit Formula to find the 9th term**

$a_9 = (-3)(-3)^{(9-1)} = -19,683$

**Find the $n^{th}$ term using an Explicit Formula**

3. $a_1 = 200 \quad r = \frac{1}{2} \quad n = 7$

$a_n = 200\left(\frac{1}{2}\right)^{(n-1)}$

$a_7 = 200\left(\frac{1}{2}\right)^{(7-1)}$

$a_7 = 3.125$

4. $a_1 = 2 \quad r = 3 \quad n = 15$

$a_n = 2(3)^{n-1}$

$a_{15} = 2(3)^{(15-1)}$

$a_{15} = 9,565,938$

**Write a Explicit Formula for the nth term of the geometric sequence. Then find $a_8$ using your formula.**

p. 46

5. 5, 10, 20, 40, ... $r = 2$

a.) Explicit Formula $a_n = 5(2)^{(n-1)}$

b.) Find $a_8$ $a_8 = 5(2)^{(8-1)}$

$a_8 = 640$

6. 6, -30, 150, -750, ... $r = -5$

a.) Explicit Formula $a_n = 6(-5)^{(n-1)}$

b.) Find $a_8$ $a_8 = 6(-5)^{(8-1)}$

$a_8 = -468,750$

# Closing Question

p. 46

**You decide to try a new savings plan. You will deposit $10 at the end of week 1, $20 at the end of week 2, and $40 at the end of week 3. You will continue this pattern.**

10, 20, 40, . . . . ·2

a) What kind of sequence is this? Arithmetic / Geometric

b) Write an Explicit Formula that represents the sequence described

$a_n = 10(2)^{(n-1)}$

c) Using your formula from part B, how much money will you deposit in week 10?

$a_{10} = 10(2)^{(10-1)} = \$5{,}120$

Is this a sustainable pattern of savings?

Practice!