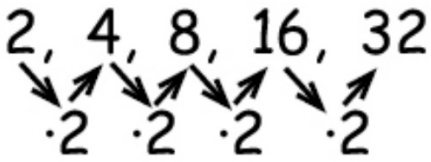
$$\begin{array}{r} 8 = 5 - y \\ -5 \quad -5 \quad y \\ \hline +3 = -y \end{array}$$

$$y = -3$$

$$\begin{array}{r} -8 = 5 - y \\ -5 \quad -5 \quad y \\ \hline -13 = -y \end{array}$$

$$y = 13$$

Geometric Sequences



What is it?

Geometric Sequences	a sequence in which the same number is repeatedly multiplied (or divided)
Common Ratio	the number repeatedly multiplied or divided; r

multiplication
or division

Identifying a Geometric Sequence	**Determine whether the following represent geometric sequences. If yes, identify the common ratio.**
	1. 2, 10, 50, 250, … yes, $r = 5$
	2. 135, 45, 15, 5, … yes, $r = \frac{1}{3}$
	3. 6, 18, 24, 30, … no
	4. 7, -14, 28, -56, … yes, $r = -2$
	5. 80, -40, 20, -10, … yes, $r = -1/2$
	6. -9, -36, -144, -576, … yes, $r = 4$

One Step Further….

Write a recursive formula for the geometric sequences above.

1.) 2, 10, 50, 250 Geometric? Yes or NO

Common Ratio (r) = _____

a_n = $a_{n-1} \cdot 5$

2.) 135, 45, 15, 5 Geometric? Yes or NO

Common Ratio (r)= _____

a_n = $a_{n-1} \cdot 1/3$

$a_n = a_{n-1} \cdot r$

next = now · 1/3

Continuing Geometric Sequences	**Given the geometric sequence, find the next three terms.** **7.** 7, -21, 63, -189, 567, -1701 **8.** 3072, 768, 192, 48, 12, 3 **9.** 8, 4, 2, 1, $\frac{1}{2}$, $\frac{1}{4}$ **10.** -5, -25, -125, -625, -3125, -15625

7.) $a_n = a_{n-1} \cdot -3$

8.) $a_n = a_{n-1} \cdot \frac{1}{4}$

9.) $a_n = a_{n-1} \cdot \frac{1}{2}$

$a_4 = a_3 \cdot \frac{1}{2}$

$a_4 = 2 \cdot \frac{1}{2}$

$a_4 = 1$

Geometric Sequences:
THE EXPLICIT FORMULA

Geometric Sequence Formula	The n^{th} term of a geometric sequence can be found using the following formula: $a_n = a_1 \cdot r^{n-1}$

Examples

Write the rule for the nth term, then find a_7.

11. 3, 9, 27, ...

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

$a_7 = 3 \cdot 3^{7-1}$

$a_7 = 3 \cdot 3^6$ $a_7 = 2187$

r = 3

a_1 = 3

n= _____

12. -4, 20, -100, ...

$a_n = -4 \cdot -5^{n-1}$

$a_7 = -4 \cdot (-5)^{7-1}$

$a_7 = -4 \cdot (-5)^6$

$a_7 = -62500$

r = -5

a_1 = -4

n= _____

13. 400, 200, 100, …

r =_____

a_1 = _____

n= _____

14. 1, 5, 25, …

r =_____

a_1 = _____

n= _____

You Try:

15. -1, -4, -16, …

r =_____

a_1 = _____

n= _____

16. 729, -243, 81, …

r =_____

a_1 = _____

n= _____

Formulas and their Purpose

Geometric Sequences

Explicit Formula: $A_n = a_1 \cdot r^{n-1}$

First Term

Current Term

Common Ratio

"Finds a specific term"

Previous Term

Recursive Formula: $A_n = A_{n-1} \cdot r$

"Uses previous terms to find the next terms"

17. 6, -12, 24, …

r = _____

a_1 = _____

n= _____

18. 8, 12, 18, …

r = 3/2

a_1 = 8

n= _____

$a_7 = 91.125$

$a_n = 8 \cdot \left(\frac{3}{2}\right)^{n-1}$

$a_7 = 8\left(\frac{3}{2}\right)^6$

Real Life Application

Year	Value ($)
1	10,000
2	8,000
3	6,400

The table to the left shows a car's value for 3 years after it is purchased.

19. Write a rule to represent the car's depreciation.

$r = 4/5$ OR $.8$ $a_n = 10{,}000 \cdot (.8)^{n-1}$

20. What will be the value of the car after 10 years?

$a_{10} = 10{,}000 \cdot (.8)^{10-1}$

$a_{10} = \$1342.17$