

## 5.1 Arithmetic & Geometric Sequences

- Ex: in an outdoor theater, there are 14 seats in the first row, and 3 additional seats in every row thereafter. How many seats are there in the 52nd row? common  $d = 3$

$$3(x-1) + 14$$

$$3x - 3 + 14 \longrightarrow 3x + 11 \longrightarrow 3(52) + 11 =$$

- Sequence: ordered list of numbers  
- each specific # is a term in the sequence
- Arithmetic Sequence: sequence where you add/subtract same amount to get to the next term
  - Common Difference ( $d$ ): amount you add or subtract

### Explicit Formula

$$3(x-1) + 14$$

$$(d(x-1) + a_1)$$

$$\boxed{a_n = d(n-1) + a_1}$$

\* gives you individual terms in a sequence

$d$  = common difference

$a_1$  = first term

### Recursive Formula

\* depends on previous term

$a_1 =$

$$\boxed{a_n = a_{n-1} + d}$$

\* must give a starting term

EX: Write the explicit & recursive formula

12, 3, -6, -15, ...

$$d = -9$$

$$n = 12$$

Recursive  $\rightarrow$  
$$\begin{aligned} a_n &= a_{n-1} - 9 \\ a_1 &= 12 \end{aligned}$$

Explicit  $\rightarrow$  
$$\begin{aligned} a_n &= d(n-1) + a_1 \\ a_n &= -9(n-1) + 12 \end{aligned}$$

$$a_n = -9n + 21$$

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EX: find the 23<sup>rd</sup> term of -3, 2, 7, 12, ...

$$d = 5 \quad n = -3$$

$$a(23) = 5(-3-1) + -3 \rightarrow$$

$$a_n = 5(n-1) - 3$$

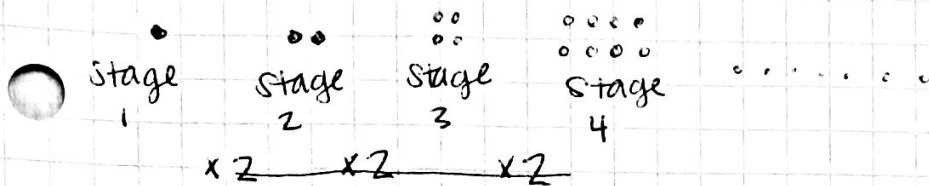
$$5n - 5 - 3$$

$$5n - 8$$

$$a(23) = 5(23) - 8 = 107$$

$$a(23) = 107$$

Write a formula for the pattern below.



Recursive  
 $a_n = 2a_{n-1}$   
 $a_1 = 1$

Explicit  
 $a_n = 2^{n-1}$

$r = 2$   


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


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

• Geometric Sequence: sequence where you multiply by a common ratio (r) to get to the next term

Ex: find the 10<sup>th</sup> term of the sequence

a) 5, 15, 45, 135

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

$a(10) = 5(3)^9 = \boxed{a(10) = 98415}$

b) 6, 2,  $\frac{2}{3}$ ,  $\frac{2}{9}$

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

.000304831

$a(10) = 6\left(\frac{1}{3}\right)^9 = \boxed{a(10) = \frac{2}{6561}}$

\* division = multiply by a fraction

$r = \frac{a_2}{a_1}$