

# Warm Up

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

G

- 81, 27, 9, 3, 1,  $\frac{1}{3}, \dots$

$$a_n = 81 \cdot \left(\frac{1}{3}\right)^{n-1}$$

state the pattern  
then write the

G

- -2, 4, -8, 16, -32, 64, -128

$$r = -2 \quad a_n = -2 \cdot (-2)^{n-1}$$

explicit formula for each

A

- 3, 6, 9, 12, 15, 18, 21, 24, ...

$$d = +3 \quad a_n = 3 + (n-1)(3)$$

A

- 25, 20, 15, 10, 5, 0, -5, -10, ...

$$d = -5 \quad a_n = 25 + (n-1)(-5)$$

Spring 2019 Exam Schedule		
Teacher-Made Exam Schedule	1st Block Teacher-Made Exam	Thursday, May 23
	2nd Block Teacher-Made Exam	Friday, May 24
	3rd Block Teacher-Made Exam	Tuesday, May 28
	4th Block Teacher-Made Exam	Wednesday, May 29
Yearlong (A-Day/B-Day) Teacher-Made Exam Schedule	1st Block A-Day and 2nd Block A-Day	Thursday, May 23
	1st Block B-Day and 2nd Block B-Day	Friday, May 24
	3rd Block A-Day and 4th Block A-Day	Tuesday, May 28
	3rd Block B-Day and 4th Block B-Day	Wednesday, May 29
EOC/NCFE Exam Schedule	1st Block	Friday, May 31
	2nd Block	Monday, June 3
	3rd Block	Wednesday, June 5
	4th Block	Thursday, June 6
	Make-ups	Friday, June 7

# Unit 9: Sequences & Series

## *Key Words*

- Arithmetic
- Geometric
- Sequence
- Explicit
- Recursive
- Infinite
- Finite
- Series / Partial Sums
- Summation Notation
- Series Formulas

## 9.3 I can analyze series using summation notation

$$\sum_{i=m}^n f(i)$$

# Objective 9.4

Arithmetic &  
Geometric **Series**

**"Partial Sums"**

## Series Formulas

### Arithmetic Series

$$S_n = \frac{n}{2} (a_1 + a_n)$$

$n$  = term #

$a_1$  = 1<sup>st</sup> term

$a_n$  = any term

### Geometric Series

$$S_n = \frac{a_1(1 - r^n)}{(1 - r)} \quad \begin{array}{l} \text{when it's} \\ \text{a whole} \\ \text{\#} \\ \text{\textcircled{r} \neq 1} \end{array}$$

$$S = \frac{a_1}{1 - r} \quad \text{\textcircled{|r| < 1}}$$

when  
 $r$  is a

\* on your formula sheet fraction.

## **Steps for Evaluating**

1. Determine if arithmetic or geometric
2. Substitute the information into the formula

### Example 1

Evaluate a series with terms  
1, 7, 13, 19, 25 for the first 13 terms  
 $\overline{n=13}$

$+6+6+6$

$$a_{13} = a_1 + (n-1)d \quad \text{Arithmetic}$$

$$a_{13} = 1 + (13-1)(6)$$

$$a_{13} = 1 + (12)(6)$$

$$a_{13} = 73$$

$$S_n = \frac{n}{2} (a_1 + a_n)$$

$$S_{13} = \frac{13}{2} (1 + a_{13})$$

$$S_{13} = \frac{13}{2} (1 + 73)$$

$$S_{13} = 481$$

## Example 2

Find the sum of the first 10 terms of the geometric series with  $a_1 = 6$  and  $r = 2$ .

$$S = \frac{a_1(1-r^n)}{(1-r)}$$

$$S = \frac{6(1-2^{10})}{(1-2)} = \boxed{6138}$$



### Example 3

A philanthropist donates \$50 to the SPCA. Each year, she pledges to donate 12 dollars more than the previous year. In 8 years, what is the total amount she will have donated?

$$a_1 = \underline{50}, \overset{\overbrace{d=12}}{\underbrace{\quad\quad}} \frac{62}{a_2}, \frac{74}{a_3}, \frac{86}{a_4}, \frac{98}{a_5}, \frac{110}{a_6}, \frac{122}{a_7}, \frac{134}{a_8}$$

$$\begin{aligned} a_{13} &= 50 + (n-1)(12) \\ &= 50 + (7)(12) \\ a_{13} &= 134 \end{aligned}$$

$$S_8 = \frac{n}{2} (a_1 + a_8)$$

$$S_8 = \frac{8}{2} (50 + 134)$$

$$S_8 = \$736$$

# 9.5

## **CONVERGENT & DIVERGENT SERIES**

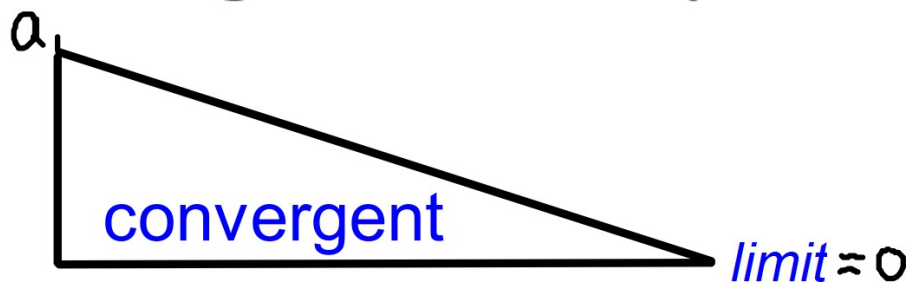
\* only apply to geometric \*  
problems

## Convergent Sequence

A sequence is **converging** if its terms approach **zero**.

$r = \frac{1}{2}$  or fraction  
divide problems

*\*Only applies to geometric sequences.*

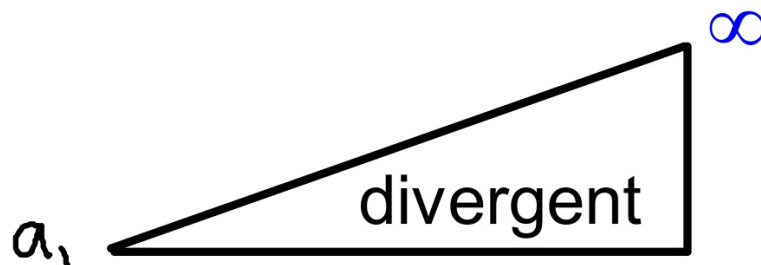


## Divergent Sequence

A sequence is **diverging** if its terms approach infinity.

$r = 2$  multiply  
patterns

*\*Only applies to geometric sequences.*



Determine if the following sequences are **convergent** or **divergent**:

- 1)  $27, 9, 3, 1, \frac{1}{3}, \frac{1}{9}, \dots$  Convergent  $r = \frac{1}{3}$   $S = \frac{a_1}{1-r}$
- 2)  $5, 15, 45, 135, \dots$  Divergent  $r = 3$   $S = \frac{a_1(1-r^n)}{(1-r)}$
- 3)  $100, 10, 1, .1, .01, .001, \dots$  Convergent  $r = \frac{1}{10}$   $S = \frac{a_1}{1-r}$

## **Unit 9 Assignment**

- Complete Part I and II today
- Ask Ms. Grosse questions
- Collaborate!

## **Unit 9 Summary**

**Complete your FINAL unit organizer  
concept map summary!**

<http://bit.ly/2HjT5i1>

**YOU DID IT!**



**NCFE Packet**  
**Work Time**

**Complete ALL the problems**

**Use the answer key to help if  
you get stuck**