

## 10.1 Equations for Arithmetic & Geometric Sequences

Name: \_\_\_\_\_

### An Introduction to Linear & Exponential Relationships



#### Warm Up:

\_\_\_\_\_ is simply repeated addition of the same number.

\_\_\_\_\_ refers to repeat multiplication of the same number.

#### On your own:

1. How can  $11+11+11+11+11+11$  be rewritten?
2. How can  $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$  be rewritten?

#### Lesson:

A sequence is

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- \_\_\_\_\_ sequences are sets of numbers that go up by adding a common difference every time.

Example:  $-6, 1, 8, 15, 22, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}$

Identify the common difference: \_\_\_\_\_

- \_\_\_\_\_ sequences are sets of numbers that go up by multiplying a common ratio every time.

Example:  $324, 108, 36, 12, 4, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}$

Identify the common ratio: \_\_\_\_\_

**On your own:** Classify the sequences below as arithmetic or geometric. Then state the common difference or ratio?

1.  $2, 4, 8, 16, 32, \dots$ ?

Arithmetic or Geometric?

Common difference or ratio:

2.  $70, 60, 50, 40, 30, \dots$

Arithmetic or Geometric?

Common difference or ratio:

## Real Life Examples

## Arithmetic Sequence

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Months	Cost	
1		
2		
3		
4		
n		

### Sketch a Graph:

## Geometric Sequence

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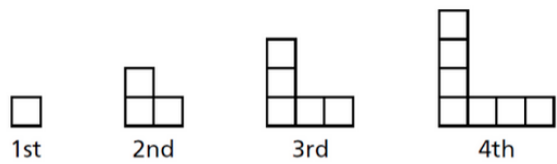
The accepted **average car depreciation** rate is roughly 15% per year.

# years owned	Estimated Value	
1		
2		
3		
4		
n		

### Sketch a Graph:

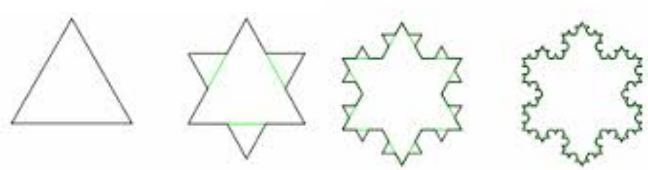
# Geometry Examples

## Arithmetic Sequence

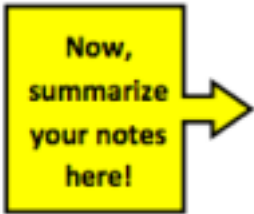


Term	Number of Squares	
1		
2		
3		
4		
n		

## Geometric Sequence



Term	# of Sides	
1		
2		
3		
4		
n		



**SUMMARY:**

## 10.1 Problem Set

1) Find the next three terms of each arithmetic sequence.

a) 3, 7, 11, 15, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

b) -13, -11, -9, -7, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

c) 22, 20, 18, 16, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

d) -2, -5, -8, -11, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

2) Find the next three terms of each geometric sequence.

a) 4, 8, 16, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

b) 1, -6, 36, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

c) 486, 162, 54, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

d) 3, 15, 75, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

3) Determine whether each sequence is an arithmetic sequence, a geometric sequence or neither.

a) 4, 7, 9, 12, ...

b) 15, 13, 11, 9, ...

c) 4, 12, 36, 108, ...

d) 5, 10, 15, 20, ...

e) 7, 10, 13, 16, ...

f) 120, -60, 30, -15, ..

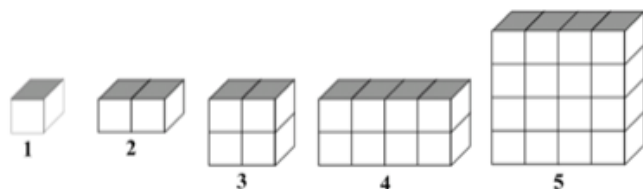
g) -6, -5, -3, -1, ...

h) -13, -6, 1, 8, ...

i) 625, 125, 25, 5, ...

#### 4) Arithmetic (Linear) or Geometric (Exponential)?

Sketch a graph of this sequence.



Does this pattern represent an arithmetic or geometric sequence? Explain.

Find how many cubes would be in the next figure?

#### 5) Arithmetic (Linear) or Geometric (Exponential)?

Sketch a graph of this sequence.



Does this pattern represent an arithmetic or geometric sequence? Explain.

Find how many dots would be in the next figure?

Based on the difference in y-values, identify the graph as linear, exponential, or neither.

6)

x	-3	-2	-1	0	1	2	3
y	14	10	6	2	-2	-6	-10

7)

x	-3	-2	-1	0	1	2	3
y	$\frac{1}{2}$	1	2	4	8	16	32

8)

x	-3	-2	-1	0	1	2	3
y	-14	-9	-4	1	6	11	16

9) **neither**

x	-3	-2	-1	0	1	2	3
y	-18	-6	-2	0	2	6	18

10) **Exponential**

x	-3	-2	-1	0	1	2	3
y	$\frac{1}{9}$	$\frac{1}{3}$	1	3	9	27	81

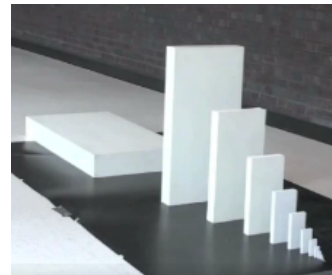
# 11) 3-Act Math #1

**Big Question:** If you wanted to topple over a domino the size of a skyscraper, how many dominoes would you need?

## Act One

Watch the introduction video. Approximate the number of dominos needed to knock over a domino the size of a skyscraper.

Low Guess	Guess	High Guess



## Act Two

What information would help solve this problem? What might you need to know? Record information below.

## Act Three

If you wanted to topple over a domino the size of a skyscraper, how many dominoes would you need? Be specific.

# of dominos	Height	
1		
2		
3		
4		
5		
6		
d		

**Equation:**

$H(d) =$  \_\_\_\_\_

**Big Question:**

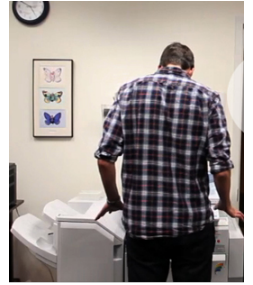
If you wanted to topple over a domino the size of a skyscraper, how many dominoes would you need?

## 12) 3-Act Math #2

Big Question: If Dan shrinks the dollar nine times like this, how big will it be?

### Act One

Watch the introduction video.



- I. Approximate how big the image will be, if Dan shrinks the dollar nine times. Will you be able to see it?
- II. Guess how large it will be by drawing on your dollar diagram.  
(Dollar diagram: Trace the size of a dollar below)

III. A. Give an answer you know is too high.  
(i.e. draw an image that is too large)

B. Give an answer you know is too low.  
(i.e. draw an image that is too small)

### Act Two

What information would help solve this problem? What might you need to know?  
Record information below.

### Act Three

1		
2		
3		
4		
5		
6		

**Equation:**

\_\_\_( ) = \_\_\_\_\_

Big Question:

If Dan shrinks the dollar nine times like this, how big will it be? Be specific.

### Sequel

IV. How many times would you have to copy the bill before it became invisible?

V. If you wanted to *expand* this bill back up to normal size with exactly one copy, what percentage would Dan have to set on the copier?

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13) Go back to problem 3 and check your answers with Mrs. Urquhart. Then, determine a formula to represent the arithmetic or geometric sequences. If it neither you don't have to do anything with it.

14) Go back to problems 6-10 and check your answers with Mrs. Urquhart. Then, determine a formula to represent the arithmetic or geometric sequences. If it neither you don't have to do anything with it.



## 10.4 Applications - Arithmetic (Linear) & Geometric (Exponential) sequences

1) Charlie deposited \$115 in a savings account. Each week thereafter, he deposits \$35 into the account.

a) Fill in the table.

Week #	Money in Account
1	
2	
3	
4	

b) Sketch a graph of what is happening.

c) Write a formula to represent this sequence.

d) How much total money has Charlie deposited after 30 weeks?

e) When will Charlie have more than \$6700 in his savings account? Write an inequality and solve.

2) A ball is dropped from a height of 500 meters. The table shows the height of each bounce.

BOUNCE #	HEIGHT (m)
1	400
2	320
3	256

a) Sketch a graph

b) Write an equation to represent the height of the ball after each bounce.

b) How high does the ball bounce on the 6th bounce?

3) 3-Act Math #4

Big Question: How much money does Fry have in his bank account right now?

**Act One**

Watch the introduction video. Approximate how much money does Fry have in his bank account right now? Write down a guess.

Low Guess	Guess	High Guess



**Act Two**

What information would help solve this problem? What might you need to know?  
Record information below.

**Act Three**

1		
2		
3		
4		
5		
6		

**Equation:**

\_\_\_( ) =  
\_\_\_\_\_  
\_\_\_\_\_

Big Question:  
How much money does Fry have in his bank account right now?

## Sequel

I. It took Fry 1,000 years to get that much money. How many more years will it take him to double it?

II. How long will it take him to get a trillion dollars?

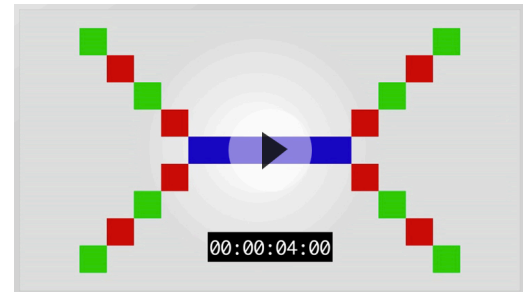
### 4) 3-Act Math #5

Big Question: When will the pixel pattern break through the box?

#### Act One

Watch the introduction video. Approximate when will the pixel pattern break through the box? After how many seconds? Will it break through the top, the sides, or the corner? Write down a guess.

Low Guess	Guess	High Guess



#### Act Two

What information would help solve this problem? What might you need to know?  
Record information below.

### Act Three

# of seconds	Height		Width	
1				
2				
3				
4				
5				
6				

Eq 1:  $\frac{\quad}{\quad} = \frac{\quad}{\quad}$

Eq 2:  $\frac{\quad}{\quad} = \frac{\quad}{\quad}$

Big Question: When will the pixel pattern break through the box?

### Sequel

What will the "aspect ratio" of the pixel pattern become if the pattern grows forever?

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4) Find the number of terms in the following arithmetic sequence.

*Hint: you will need to find the formula for the equations first.*

a) 2, 5, 8, ..... , 299

b) 9, 5, 1, ..... - 251.