Concept 17: Write Exponential Equations

START DATE:_____ *(materials are available)* **Assessment Date:**_____ *(date of 1st assessment on this concept)*	**DUE DATE:**_____ *(To stay on pace: should be done by now)* **DEADLINE:**_____ *(on THE LIST if note completed)*	***Pre-Quiz Score = _____/5*** ***Score 5 = Level 4*** ***Score 3,4 = Level 3*** ***Score 0,1,2 = Level 2***

Level 4 Example	**Level 3 Example**	**Level 2 Example**
Write an equation for the following table	Write an equation for the following table	Write an equation for the following table
X Y 0 4 1 3 2 2.25	**X Y** 0 4 1 10 2 25	**X Y** 0 4 1 12 2 36

(C) Level 2

1. **INTRODUCTION: Take Notes & Basic Practice**

Mr. Sieling's Video	Alternate Video	From Other Source
Videos are on Mr. Sieling's Website	**Videos are on Mr. Sieling's Website**	

2. **PRACTICE ACTIVITIES: (Complete at least 2)**

IXL Practice	Worksheet
AA2 (Alg2) At least 70 Score = _____	Level 2: Exponential Equations

Brain Genie	Create
Writing a Exponential Growth Function given a table of Values (ask Mr. Sieling for login info)	An explanation of how to write an exponential equation from a table

3. **QUIZ (Level 2)**

Schoology Quiz: Level 2 – Writing Exponential Equations

Level 2
Quiz Score:

3. **REMEDIATION**

Correct Mistakes on Quiz and Do Another Practice Activity

Mr. Sieling's Signature _____

(B) Level 3

1. INTRODUCTION: Take Notes & Basic Practice

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2. PRACTICE ACTIVITIES: (Complete at least 2)

IXL Practice	Worksheet
K11 (8^{th}) At least to 80 Score = _____	Level 3: Writing Exponential Equations
Brain Genie	**Create**
Solving Word Problems using The Exponential Growth Model (ask Mr. Sieling for login info)	An explanation of the formula for exponential equations involving percents

3. QUIZ (Level 3)

Schoology Quiz: Level 3 – Exponential Equations

Level 3
Quiz Score:

4. REMEDIATION

Correct Mistakes on Quiz and Do Another Practice Activity

Mr. Sieling's Signature _____

(A) Level 4

1. INTRODUCTION: Take Notes & Basic Practice

Mr. Sieling's Video	Alternate Video	From Other Source
Videos are on Mr. Sieling's Website	**Videos are on Mr. Sieling's Website**	

2. PRACTICE ACTIVITIES: (Complete at least 2)

IXL Practice	Worksheet
X3 (Alg1) At least to 80 Score = _____	Level 4: Writing Exponential Equations
Brain Genie	**Create**
Writing Exponential Decay Functions given a Table of Values (ask Mr. Sieling for login info)	An explanation of writing an exponential equation involving a decay factor

3. QUIZ (Level 2)

Schoology Quiz: Level 4 – Writing Exponential Equations

Level 4
Quiz Score:

4. REMEDIATION

Correct Mistakes on Quiz and Do Another Practice Activity

Mr. Sieling's Signature _____

Notes Level 2:

Goals:

Write an exponential equation with a whole number growth factor

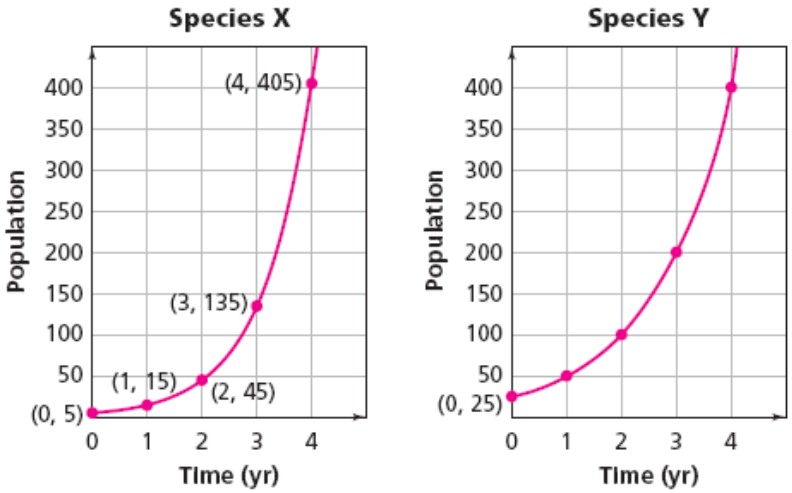
Concept # _____

Notes:

Big Ideas	Examples/Details

Level 2 Practice:

The following graphs show the population growth for two species.



a. Find the growth factors for the two species. Which species is growing faster? Explain.

b. What are the y-intercepts for the graphs of Species X and Species Y? Explain what these y-intercepts tell you about the populations.

c. Write an equation that describes the growth of Species X.

d. Write an equation that describes the growth of Species Y.

e. For which equation is $(5, 1215)$ a solution?

Consider the equation $y = 150(2^x)$.

a. Make a table of x and y-values for whole-number x-values from 0 to 5.

X	0	1	2	3	4	5
Y						

b. What do the numbers 150 and 2 in the equation tell you about the relationship?

A population of mice has a growth factor of 3. After 1 month, there are 36 mice. After 2 months, there are 108 mice.

a. How many mice were in the population initially (at 0 months)?

b. Write an equation for the population after any number of months. Explain what information the numbers and variables in your equation represent.

Worksheet Level 2:

Goals:

Write an exponential equation with a whole number growth factor

Concept # _____

Practice #1

Zak's wealthy uncle wants to donate money to Zak's school for new computers. He suggests three possible plans for his donations.

Plan 1: He will continue the pattern in this table until day 12.

Day	1	2	3	4
Donation	$1	$2	$4	$8

Plan 2: He will continue the pattern in this table until day 10.

Day	1	2	3	4
Donation	$1	$3	$9	$27

Plan 3: He will continue the pattern in this table until day 7.

Day	1	2	3	4
Donation	$1	$4	$16	$64

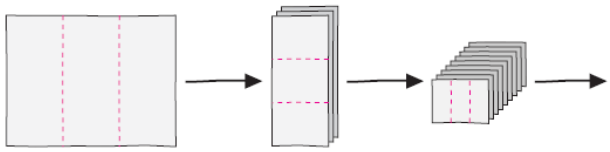
a. Copy and extend each table to show how much money the school would receive each day.

b. For each plan, write an equation for the relationship between the day number n and the number of dollars donated d.

c. Which plan would give the school the greatest total amount of money?

d. Zak says there is more than one equation for the relationship in Plan 1. He says that $d = 2^{n-1}$ and $d = \frac{1}{2}(2^n)$ both work. Is he correct? Are there two equations for each of the other plans?

Practice #2



a. Copy and complete this table to show the number of ballots after each of the first five cuts.

Number of Cuts	Number of Ballots
1	3
2	
3	
4	
5	

b. Suppose you continued this process. How many ballots would you have after 10 cuts? How many would you have after n cuts?

c. How many cuts would it take to make at least one million ballots?

Practice #3

For Exercises 9–12, find the growth factor and the *y*-intercept of the equation's graph.

9. $y = 300(3^x)$

10. $y = 300(3)^x$

11. $y = 6{,}500(2)^x$

12. $y = 2(7)^x$

Practice #4

Fido did not have fleas when his owners took him to the kennel. The number of fleas on Fido after he returned from the kennel grew according to the equation $f = 8(3^n)$, where f is the number of fleas and n is the number of weeks since he returned from the kennel. (Fido left the kennel at week 0.)

a. How many fleas did Fido pick up at the kennel?

b. What is the growth factor for the number of fleas?

c. How many fleas will Fido have after 10 weeks if he is not treated?

Practice #5

An experimental plant has an unusual growth pattern. On each day, the plant doubles its height of the previous day. On the first day of the experiment, the plant grows to twice, or 2 times, its original height. On the second day, the plant grows to 4 times its original height. On the third day, the plant grows to 8 times its original height.

a. How many times its original height does the plant reach on the sixth day? On the *n*th day?

b. If the plant is 128 cm tall on the ninth day, how tall was it just before the experiment began?

c. Is the relationship described linear, inverse, exponential, or neither? Write an equation relating the variables.

Notes Level 3:

Goals:

Write an exponential equation with a percentage growth factor

Concept # _____

Notes:

Big Ideas	Examples/Details

Level 3 Practice:

Find the growth factor associated with the percent change.

Percent Change	45%	30%	90%	20%	200%
Growth Factor					

Explain in general, how you turn a percent change, into a growth factor.

Find the percent change associated with the given growth factor.

Percent Change					
Growth Factor	1.5	1.75	1.05	2	2.8

Explain in general, how you find the the percent change, from a growth factor.

Maya's grandfather opened a savings account for her when she was born. He opened the account with $100 and did not add or take out any money after that. The money in the account grows at a rate of 4% per year.

a. Make a table to show the amount in the account from the time Maya was born until she turned 10.

Year	0	1	2	3	4	5	6	7	8	9	10
Money ($)	100										

b. What is the growth factor for the account?

Growth Factor = _____

c. Write an equation for the value of the account after any number of years.

Y = _____

Worksheet Level 3:

Concept # _____

Goals:

Write an exponential equation with a percentage growth factor

Practice #1

For each table state whether the relationship is linear, exponential, or neither.

If the relationship is linear or exponential, write an equation.

x	0	1	2	3	4	5
y	2	9	16	23	30	37

x	0	1	2	3	4	5
y	2	4	8	16	32	64

x	0	1	2	3	4	5
y	$\frac{1}{16}$	$\frac{1}{4}$	1	4	16	64

x	0	1	2	3	4	5
y	1	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$

x	0	1	2	3	4	5
y	1	14	116	614	2,156	10,124

Practice #2

$5,000 at 6% for 4 years.

Principal at Beginning of Year	Interest	Balance
Year 1: $5,000		
Year 2:		
Year 3:		
Year 4:		

Growth Factor:_____

General Equation:_____

$7,200 at 3% for 4 years

Principal at Beginning of Year	Interest	Balance
Year 1: $7,200		
Year 2:		
Year 3:		
Year 4:		

Growth Factor:_____

General Equation:_____

Practice #3

a. The table shows that the elk population in a state forest is growing exponentially. What is the growth factor? Explain.

Growth Factor = _____

Explain:

Growth of Elk Population

Time (yr)	Population
0	30
1	57
2	108
3	206
4	391
5	743

b. Suppose this growth pattern continues. How many elk will there be after 10 years? How many elk will there be after 15 years?

10 years = _____ 15 years = _____

Work:

c. Write an equation you could use to predict the elk population p for any year n after the elk were first counted.

P = _____

d. In how many years will the population exceed one million?

_____years

Practice #4

Suppose you deposit $1,000 in a savings account that earns interest of 6% per year on the current balance in the account.

a. If you leave your money in the account for 10 years, what will the value of your investment be at the end of the 10 years?

b. Write an equation relating the variables.

Notes Level 4:

Concept # _____

Goals:

Write an exponential equation with a decay factor

Notes:

Big Ideas	Examples/Details

Basic Practice:

Chen, from Problem 4.1, finds that his ballots are very small after only a few cuts. He decides to start with a larger sheet of paper. The new paper has an area of 324 in^2. Copy and complete this table to show the area of each ballot after each of the first 10 cuts.

a. Write an equation for the area A of a ballot after any cut n.

b. With the smaller sheet of paper, the area of a ballot is 1 in^2 after 6 cuts. How many cuts does it take to get ballots this small, starting with the larger sheet?

c. Chen wants to be able to make 12 cuts before getting ballots with an area of 1 in^2. How large does his starting piece of paper need to be?

Number of Cuts	Area ($in.^2$)
0	324
1	162
2	81
3	
4	
5	
6	
7	
8	
9	
10	

Penicillin decays exponentially in the human body. Suppose you receive a 300-milligram dose of penicillin to combat strep throat. About 180 milligrams will remain active in your blood after 1 day.

a. Assume the amount of penicillin active in your blood decreases exponentially. Make a table showing the amount of active penicillin in your blood for 7 days after a 300-milligram dose.

b. Write an equation for the relationship between the number of days d since you took the penicillin and the amount of the medicine m remaining active in your blood.

c. What would be the equation if you had taken a 400-milligram dose?

In Exercises 4 and 5, tell whether the equation represents exponential decay or exponential growth. Explain your reasoning.

4. $y = 0.8(2.1)^x$

5. $y = 20(0.5)^x$

Worksheet Level 4:

Concept # _____

Goals:

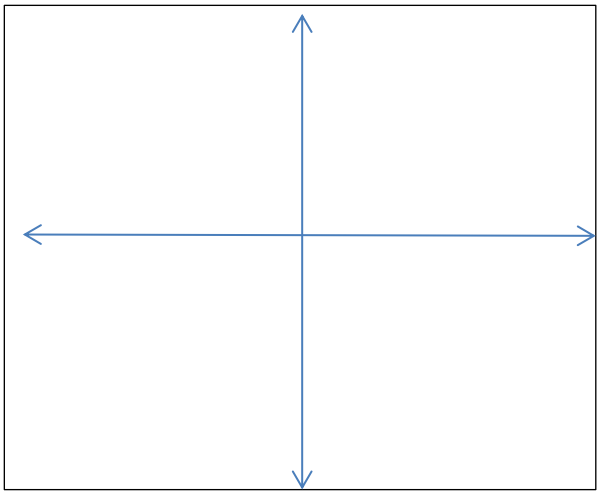
Write an exponential equation with a decay factor

Practice #1

Graph these three equations using www.desmos.com

Consider these equations:

$y = 0.75^x$ $y = 0.25^x$ $y = -0.5x + 1$



a. Which equations are exponential relationships?
Explain how you know.

b. Sketch a graph with all three lines to the right.

c. What point do all three lines have in common?

d. Which line decreases the fastest?

Practice #2

A tree farm has begun to harvest a section of trees that was planted a number of years ago.

Supply of Trees

Year	0	1	2	3	4	5	6	7	8
Trees Remaining	10,000	9,502	9,026	8,574	8,145	7,737	7,350	6,892	6,543

a. Suppose the relationship between the year and the trees remaining is exponential. Approximate the decay factor for this relationship.

b. Write an equation for the relationship between time and trees remaining.

c. Evaluate your equation for each of the years shown in the table below to find the approximate number of trees remaining.

Supply of Trees

Year	10	15	20	25	30	35	40
Trees Remaining							

Practice #3

Kai's brother collects fuzzy insects called tribetts. The tribett population decreases by 30% each year.

a. Make a table showing the number of tribetts at the end of the first 5 years for a starting population of 10,000 tribetts.

Tribett Population

Year	0	1	2	3	4	5
Tribetts						

b. Write an equation for the relationship between years and number of tribetts.

c. In what year will there first be fewer than 1,000 tribetts?

Practice #4

Write an exponential function to model each situation. Find each amount after the specified time.

2. Suppose the acreage of forest is decreasing by 2% per year because of development. If there are currently 4,500,000 acres of forest, determine the amount of forest land after each of the following.

a. 3 years **b.** 5 years **c.** 10 years **d.** 20 years

3. A $10,500 investment has a 15% loss each year. Determine the value of the investment after each of the following.

a. 1 year **b.** 2 years **c.** 4 years **d.** 10 years

4. A city of 2,950,000 people has a 2.5% annual decrease in population. Determine the city's population after each of the following.

a. 1 year **b.** 5 years **c.** 15 years **d.** 25 years

5. A $25,000 purchase decreases 12% in value per year. Determine the value of the purchase after each of the following.

a. 1 year **b.** 3 years **c.** 5 years **d.** 7 years