(A) Lesson Context

BIG PICTURE of this UNIT:	• How can I analyze growth or decay patterns in data sets & contextual problems? • How can I algebraically & graphically summarize growth or decay patterns? • How can I compare & contrast linear and exponential models for growth and decay problems.		
CONTEXT of this LESSON:	Where we've been In Lesson 1, you generated data from a variety of activities	Where we are How do we analyze data in order to determine the patterns/relationships exist in data sets that exhibit growth & decay patterns	Where we are heading How can I develop equations that will help me make predictions about scenarios which feature exponential growth & decay?

(B) Lesson Objectives:

a. Generate data through various hands-on activities
b. Analyze the data to look for patterns in the data that was generated
c. Make predictions/extrapolations through numeric or algebraic analysis

(C) Fast Five

For problems 1 through 36, rewrite without zero or negative exponents.

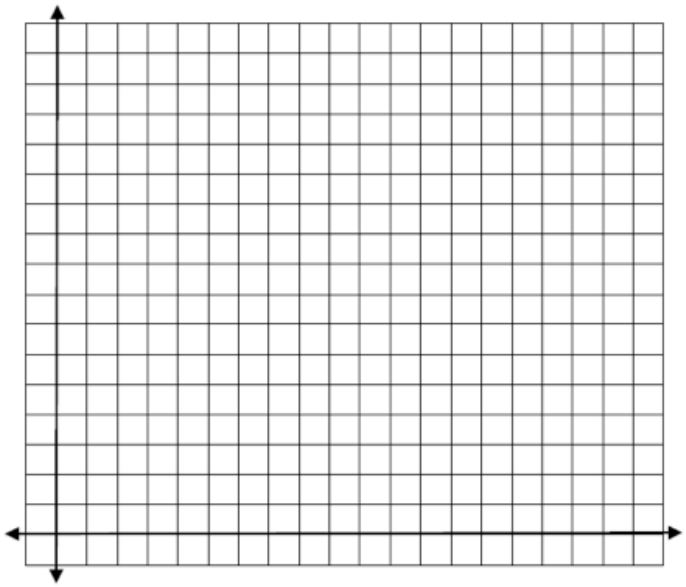
1. $4^{-3} =$
2. $-5^{-2} =$
3. $5^{0} =$
4. $10^{-2} =$
5. $-4^{-3} =$
6. $2^{-4} =$
7. $\frac{1}{2^{-2}} =$
8. $\frac{1}{4^{0}} =$
9. $(-3)^{-2} =$
17. $-3^{0} =$
18. $8x^{0}y^{-3} =$
19. $(-3)^{-3} =$
20. $\left(\frac{1}{2}\right)^{-1} =$
21. $\left(\frac{1}{2}\right)^{-2} =$
22. $\left(\frac{1}{3}\right)^{-1} =$
23. $1^{-6} =$
24. $(-5)^{0} =$
25. $(-1)^{-2} =$
37. y^{-3} for $y = 2$
38. y^{-3} for $y = \frac{1}{2}$
39. $2x^{-4}y^{-1}$ for $x = 2, y = \frac{1}{3}$
40. $(x+3)^{-2}$ for $x = -4$
41. x^{-y} for $x = -2, y = 2$
42. $\left(x^{4}y^{2}\right)^{0}$ for $x = \frac{4}{3}, y = -\frac{2}{7}$
43. $x^{y}x^{-y}$ for $x = \frac{2}{5}, y = -\frac{4}{3}$

DATA SET ANALYSIS #1

Data Set #1 ➔ {1,2,4,8,16,32,64,….} ➔ and as a data table ➔

X	0	1	2	3	4	5	6
y	1	2	4	8	16	32	64

Describe the pattern in words



MATH ANALYSIS ➔ Common Ratio

Option #1: ➔ To calculate the common ratio, we will divide successive y values.

$ratio = \frac{y_2}{y_1} = \frac{y_3}{y_2} = \frac{y_4}{y_3} = \frac{y_5}{y_4}$ etc ..... ➔ observation ….. ?

Which leads to an equation ➔ $y = ab^x$

MATH ANALYSIS ➔ Percent Change

Option #2: ➔ To calculate the percentage, we will calculate the percent change for each trial using the formula below.

$percentage\ change = r = \frac{y_2 - y_1}{y_1} = \frac{y_3 - y_2}{y_2} = \frac{y_4 - y_3}{y_3} = \frac{y_5 - y_4}{y_4} =$ etc .... ➔ observation ….. ?

Which leads to an equation ➔ $y = a(1+r)^x$ ➔

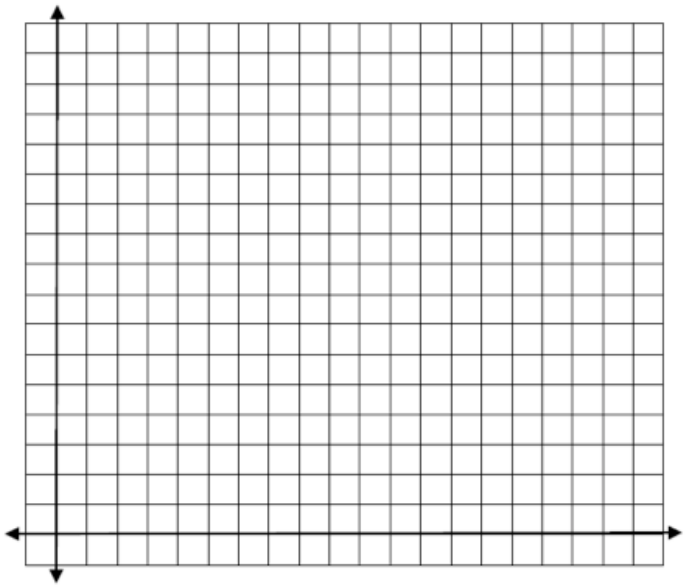
VERIFICATION ➔ use the TI-84 calculator to verify our equation:

DATA SET ANALYSIS #2

Data Set #2 ➔ {5,10,20,40,80,160,320,….} ➔as a data table ➔

X	0	1	2	3	4	5	6
y	5	10	20	40	80	160	320

Describe the pattern in words



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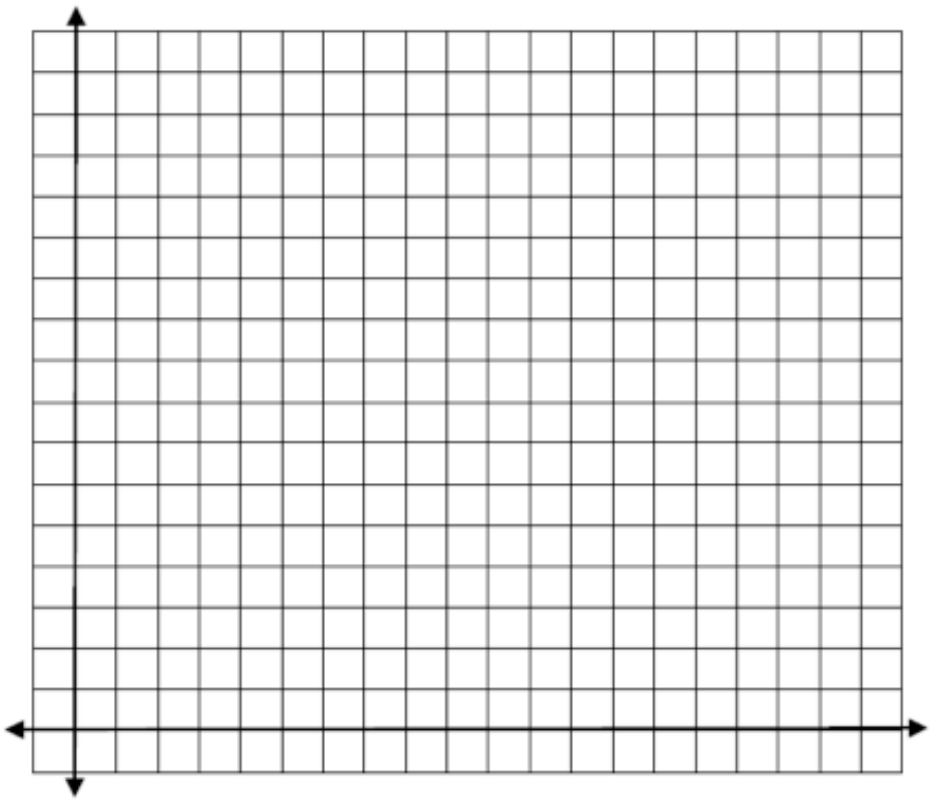
Which leads to an equation ➔ $y = a(1+r)^x$ ➔

VERIFICATION ➔ use the TI-84 calculator to verify our equation:

DATA SET ANALYSIS #3

Year	Population
1700	250
1750	370
1800	560
1850	840
1900	1270
1950	1900
2000	2850



MATH ANALYSIS ➔ Common Ratio

Option #1: ➔ To calculate the common ratio, we will divide successive y values.

Calculate the average of ALL the ratios:

_____

Which leads to an equation ➔ $y = ab^x$

MATH ANALYSIS ➔ Percent Change

Option #2: ➔ To calculate the percentage, we will calculate the percent change for each trial using the formula below.

Calculate the average of ALL the percents:

_____

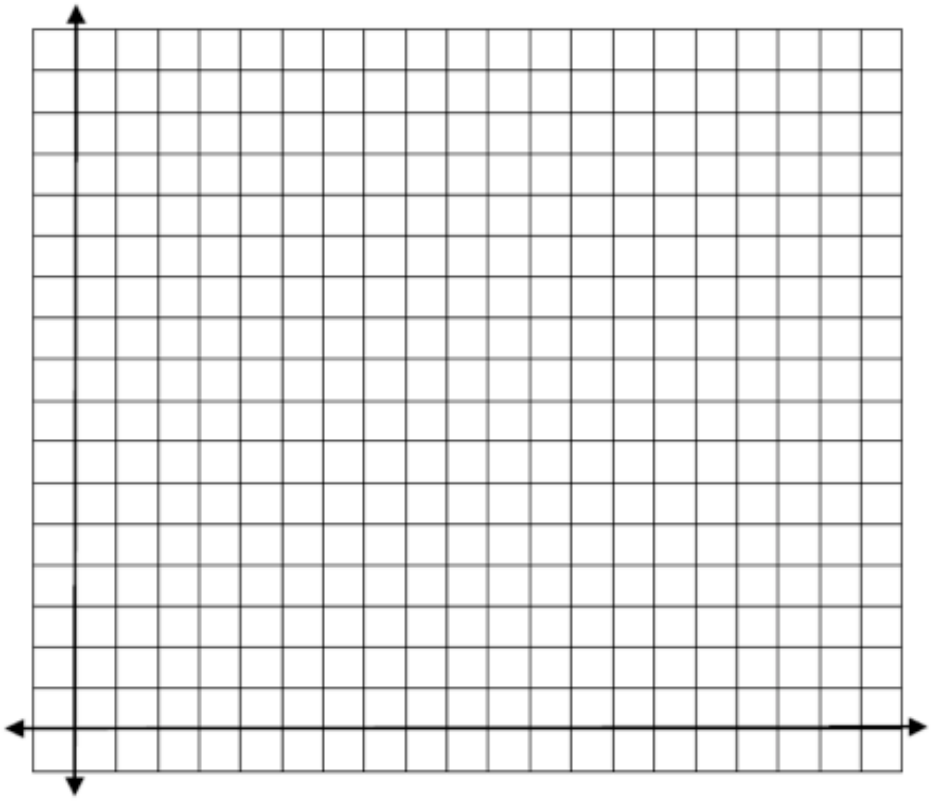
Which leads to an equation ➔ $y = a(1+r)^x$ ➔

VERIFICATION ➔ use the TI-84 calculator to verify our equation:

(D)Data Analysis ➔ *Part I: Modeling Exponential Data*

The value of Mr S car is depreciating over time. I bought the car new in 2002 and the value of my car (in thousands) over the years has been tabulated below:

Year	Value
2002	40
2003	36
2004	32.4
2005	29.2
2006	26.2
2007	23.6
2008	21.3
2009	19.1
2010	17.2



MATH ANALYSIS ➔ Common Ratio

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MATH ANALYSIS ➔ Percent Change

Option #2: ➔ To calculate the percentage, we will calculate the percent change for each trial using the formula below.

Calculate the average of ALL the percents:

_____

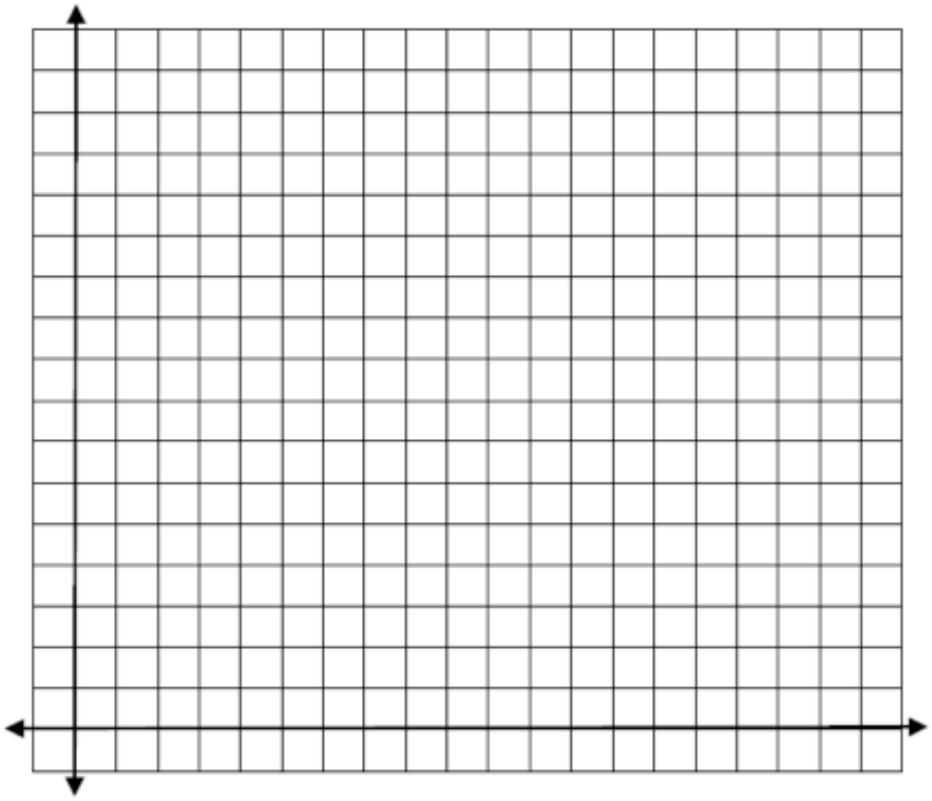
Which leads to an equation ➔ $y = a(1+r)^x$ ➔

VERIFICATION ➔ use the TI-84 calculator to verify our equation:

(E) DATA ANALYSIS ➔ *Part II: Modeling Exponential Data*

The following data table shows the historic world population since 1950:

Year	Population
1950	2.56
1960	3.04
1970	3.71
1980	4.45
1990	5.29
1995	5.780
2000	6.09
2005	6.47
2010	6.90



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Option #2: ➔ To calculate the percentage, we will calculate the percent change for each trial using the formula below.

Calculate the average of ALL the percents:

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Which leads to an equation ➔ $y = a(1+r)^x$ ➔

VERIFICATION ➔ use the TI-84 calculator to verify our equation: