## (A) Lesson Context

| | | | |
|---|---|---|---|
| BIG PICTURE of this UNIT: | • How can I analyze growth or decay patterns in data sets & contextual problems?<br>• How can I algebraically & graphically summarize growth or decay patterns?<br>• How can I compare & contrast linear and exponential models for growth and decay problems. | | |
| CONTEXT of this LESSON: | Where we've been<br><br>In Lesson 1, you generated data from a variety of activities | Where we are<br><br>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<br><br>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

Evaluate f(3) if $f(x) = 3(1.5)^x$

Evaluate f(4) if $f(x) = 50(0.75)^x$

Evaluate f(2) if $f(x) = 5.6(10)^x$

Evaluate f(-2) if $f(x) = 3(1.5)^x$

Evaluate f(-3) if $f(x) = 50(0.75)^x$

Evaluate f(-4) if $f(x) = 5.6(10)^x$

Evaluate f(0) if $f(x) = 3(1.5)^x$

Evaluate f(0) if $f(x) = 50(0.75)^x$

Evaluate f(0) if $f(x) = 5.6(10)^x$

Evaluate f(2.5) if $f(x) = 3(1.5)^x$

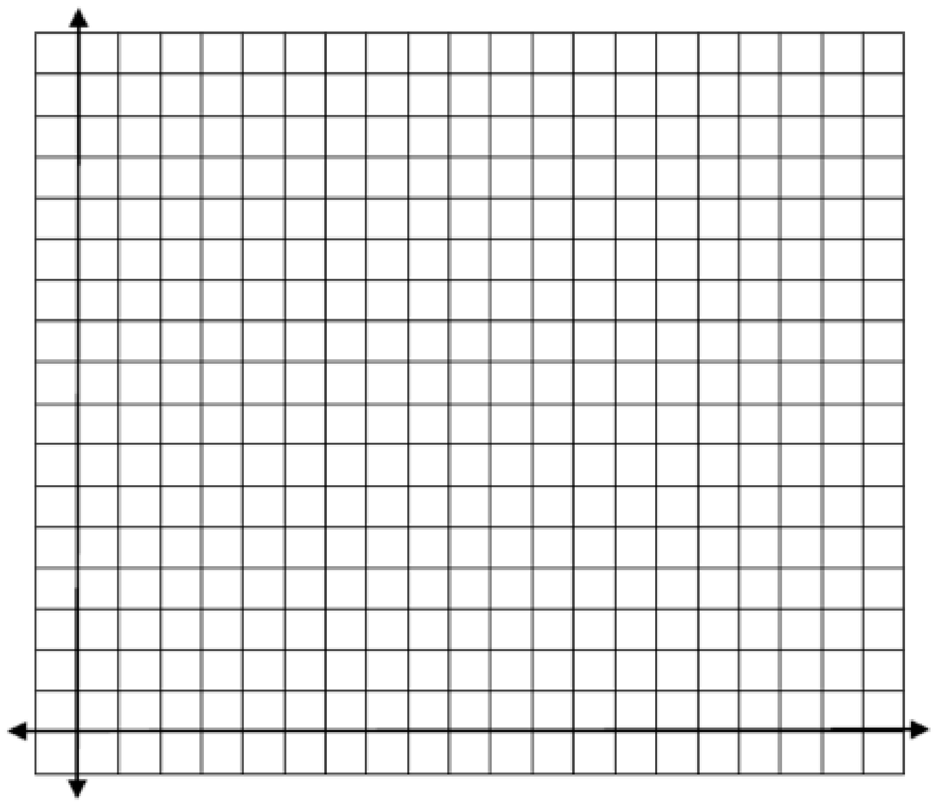
Evaluate f(2.25) if $f(x) = 50(0.75)^x$

Evaluate f(2.75) if $f(x) = 5.6(10)^x$

## (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 → Percent Change → To calculate the percentage, we will calculate the percent change for each trial using the formula below.

$$percentage\,change = r = \frac{y_2 - y_1}{y_1} = \frac{y_3 - y_2}{y_2} = \frac{y_4 - y_3}{y_3} = \frac{y_5 - y_4}{y_4} = \text{ etc ....}$$ → observation ..... ?

How will we define the independent variable, x?

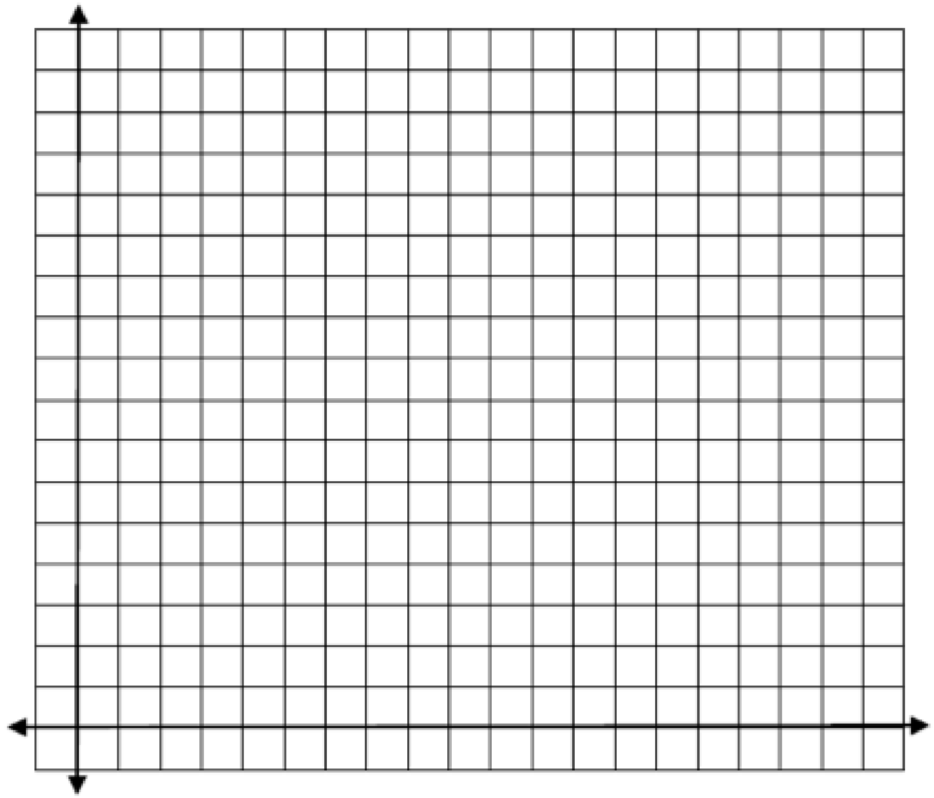
Which leads to an equation → $y = a(1+r)^x$ →

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 |



MATH ANALYSIS ➔ Common Ratio ➔ To calculate the common ratio, we will divide successive y values.

Calculate the average of ALL the ratios: ___________________

How will we define the independent variable, x?

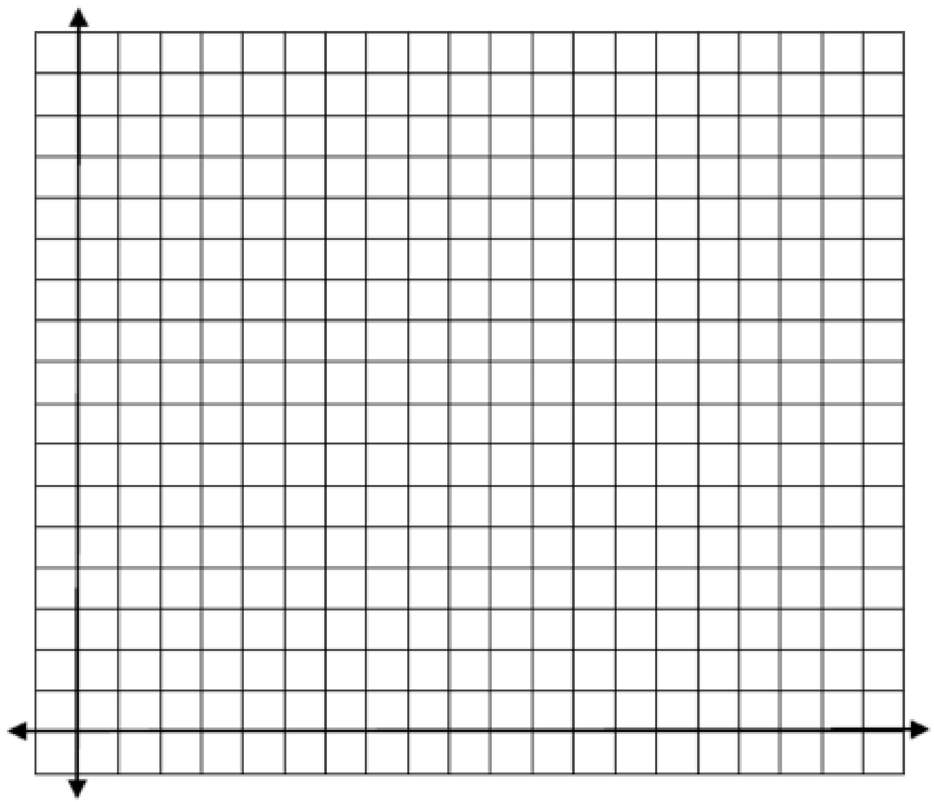
Which leads to an equation ➔ $y = ab^x$

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

## (F) Data Analysis → *Part III: Modeling Exponential Data*

The following data table shows the value of an education fund that Mr S has set up for his son, Andrew:

| Year | Value of fund |
|---|---|
| 2000 | 12,500 |
| 2001 | 13,690 |
| 2002 | 14,920 |
| 2003 | 16,200 |
| 2004 | 17,660 |
| 2005 | 19,250 |
| 2006 | 21,020 |
| 2007 | 22,900 |
| 2008 | 24,750 |



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: ____________________

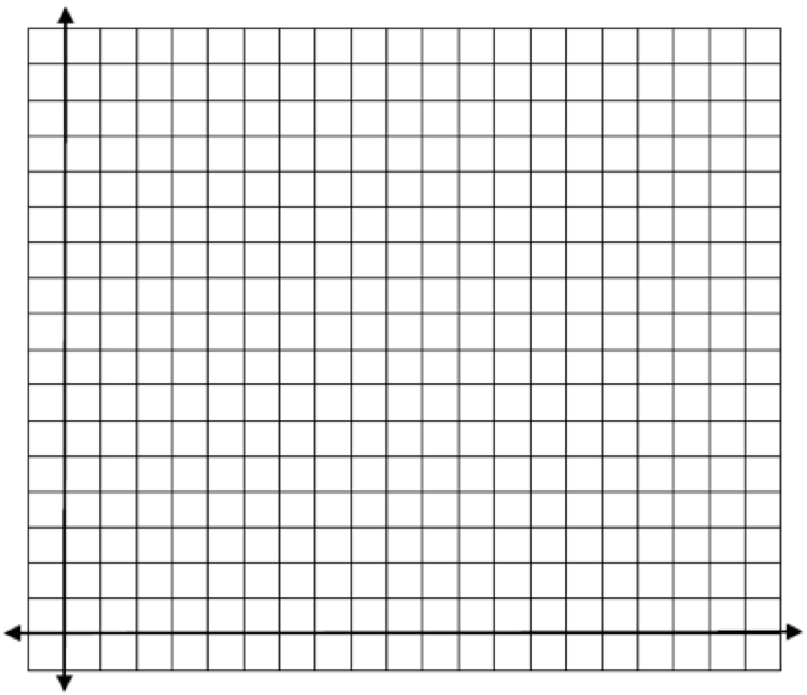
Which leads to an equation → $y = a(1+r)^x$ →

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

## (G)Data Analysis ➔ *Part IV: Modeling Exponential Data*

The pesticide DDT was widely used in the United States until its ban in 1972. DDT is toxic to a wide range of animals and aquatic life, and is suspected to cause cancer in humans. The *half-life* of DDT can be 10 or more years. *Half-life* is the amount of time it takes for half of the amount of a substance to decay. Scientists and environmentalists worry about such substances because these hazardous materials continue to be dangerous for many years after their disposal.

So, in 1960, city parks were sprayed with DDT to control the mosquitoes in city parks. Each city park was sprayed with 300 mg of DDT. Starting in the year 2000, city officials have been measuring how much DDT remains in their parks and the data is recorded below



| Year | Amt of DDT |
|---|---|
| 1960 | 300 |
| 2000 | 18.75 |
| 2001 | 17.49 |
| 2002 | 16.32 |
| 2003 | 15.23 |
| 2004 | 14.21 |
| 2005 | 13.26 |
| 2006 | 12.37 |
| 2007 | 11.54 |
| 2008 | 10.77 |

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:

____________________

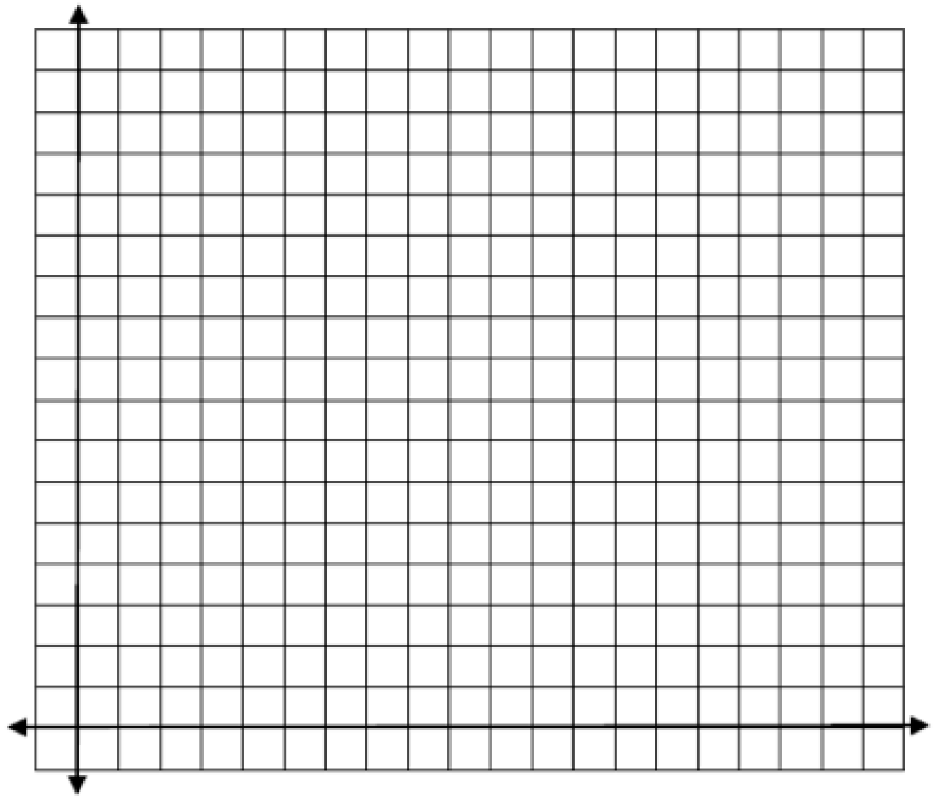
Which leads to an equation ➔ $y = a(1+r)^x$ ➔

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

## (H)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 |



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: