About the Lesson

In this activity, students will graph data modeling three different real-world scenarios. Three sets of data will represent exponential growth, logarithmic growth, and exponential decay. As a result, students will:

- Find equations representing each set of data.

Vocabulary

- exponential growth
- logarithmic growth
- exponential decay

Teacher Preparation and Notes

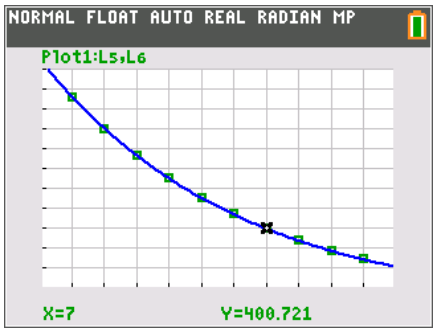
- Students should have some familiarity with compound interest formula in order to be able to find the growth of the exponential data given in Problem 1 of this activity.
- Students should understand the concept of basic logarithms in order to determine the base of the log function for Problem 2 of this activity.
- The data in lists **L1** to **L6** will need to be loaded into the student calculators before beginning this activity.

Activity Materials

- Compatible TI Technologies:

  TI-84 Plus*
  TI-84 Plus Silver Edition*
  TI-84 Plus C Silver Edition
  TI-84 Plus CE

***** *with the latest operating system (2.55MP) featuring MathPrint™ functionality.*



Tech Tips:

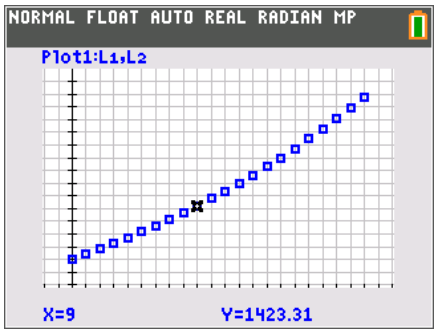
- This activity includes screen captures taken from the TI-84 Plus CE. It is also appropriate for use with the rest of the TI-84 Plus family. Slight variations to these directions may be required if using other calculator models.
- Watch for additional Tech Tips throughout the activity for the specific technology you are using.
- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials
- Any required calculator files can be distributed to students via handheld-to-handheld transfer.

Lesson Files:

- Modeling_Data_Student.pdf
- Modeling_Data_Student.doc
- L_1_.8xl
- L_2_.8xl
- L_3_.8xl
- L_4_.8xl
- L_5_.8xl
- L_6_.8xl

Problem 1 – Exponential Growth

Tech Tip: Before beginning the activity, the lists **L1**, **L2**, **L3**, **L4**, **L5**, and **L6** need to be transferred to the students' calculators via handheld-to-handheld transfer or transferred from the computer to the calculator via TI-Connect™ CE Software.



In this problem, students will graph data given in **L1** and **L2**.

Students should determine an equation for the data using their knowledge of compound interest equations.

1. The equation for the data is: _____

Answer: $y = 1000(1.04)^x$

Tech Tip: If your students are using the TI-84 Plus CE have them turn on the GridLine by pressing 2nd zoom [format] to change the graph settings. If your students are using TI-84 Plus, they could use GridDot.

Turning GridLines on may give students a better frame of reference for the behavior of the function. It may be necessary to modify the viewing window if you wish to use this feature. Pressing window and changing the values of **Xscl**: to 50 and **Yscl**: to 0.25 will provide an adequate scale. Pressing trace and using the arrow keys will allow students to move from one data point to another.

Students can plot the function to determine if it goes through the graphed points by pressing y= and entering the function.

2. What variable should be on the horizontal axis? Vertical axis?

Answers: Horizontal axis: *t* (time most likely in days or weeks); Vertical axis: *G* (amount of greenhouse gasses possibly measured in parts per million)

3. How can you determine the interest rate for this growth?

Answer: Subtract 1 from 1.04 and convert that result to a percent, (4%).

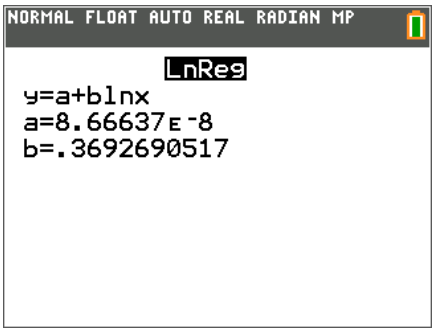
Problem 2 – Logarithmic Growth

In this problem, students will graph data given on **L3** and **L4**. Students should determine an equation for the data using the regression capabilities of the graphing calculator.

Note: To find **Y1**, press vars, scroll over to **Y-VARS**, select **1:Function…**, and select **1:Y1**.

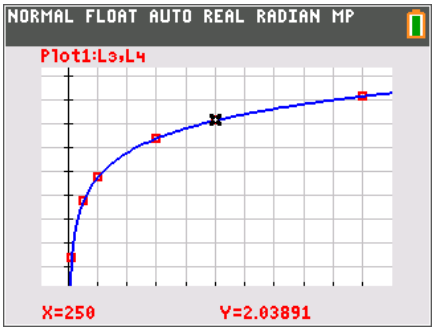
4. The equation for the data is: _____

Answer: $y = 8.6 \times 10^{-8} + 0.369 \times \ln x$



5. What variable should be on the horizontal axis? Vertical axis?

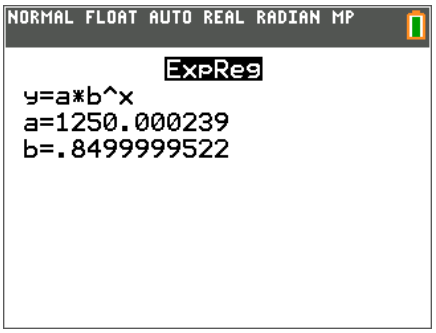
Answer: Horizontal axis: *t* (time in years); Vertical axis: *A* (amount the investment is worth).



It may be interesting to point out the difficulty in computing a percentage rate of change for a model that is defined logarithmically.

Problem 3 – Exponential Decay

In this problem, students will continue with the process in the first two problems. The given data represents exponential decay.

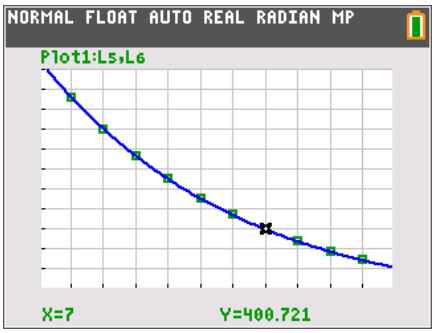


6. The equation for the data is: _____

Answer: $y = 1250(0.85)^x$

7. What is the number of acres the farmer started with in year zero?

Answer: 1250 acres



8. By what percent does the amount of acres available decrease every year?

Answer: 1 – 0.85 = 0.15 =15%