

## TI-Nspire Activity: Remember When

### Activity Overview

In this activity, students will model the relationship between years after 1930 and average income, average price of a house, and average price of a car using exponential functions. Students will then answer questions related to the models to gain a deeper understanding of exponential functions.

### Concepts







Numerical Data  
Scatter plots  
Exponential Functions  
Regression Models

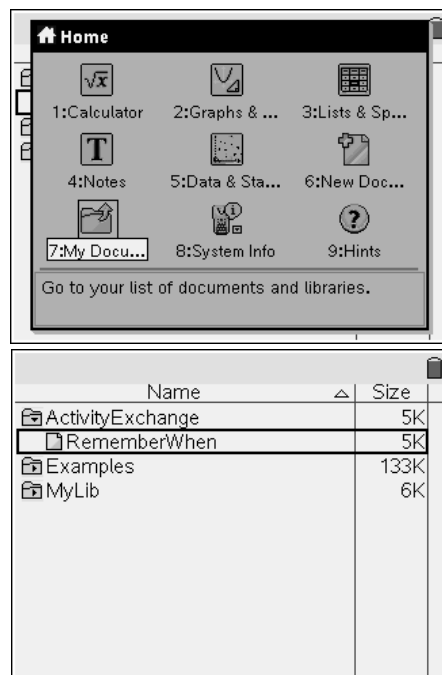
### Teacher Preparation

Transfer the *RememberWhen.tns* file onto all the student handhelds. The document contains directions for students to work individually but depending on their current familiarity with regression equations and exponential functions, groups of 2-3 students would be best.

### The Classroom

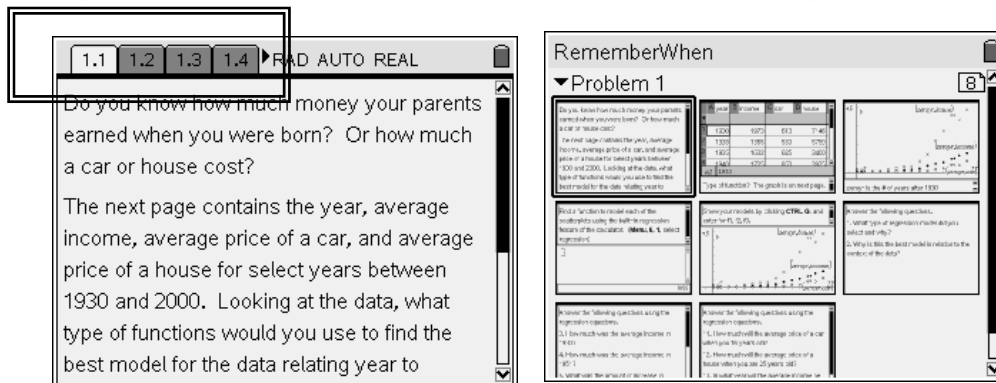
Guide the students in opening *RememberWhen.tns* document.

- Turn the device on, .
- Press the Home Key .
- Select 7:My Documents.
- Open the folder containing the TNS file by scrolling to the folder using the NavPad and pressing .
- Scroll to *RememberWhen.tns* document and press  to open it.
  - \*\*If asked if you want to save the other document, press the Tab key  to highlight the No button and press Enter .



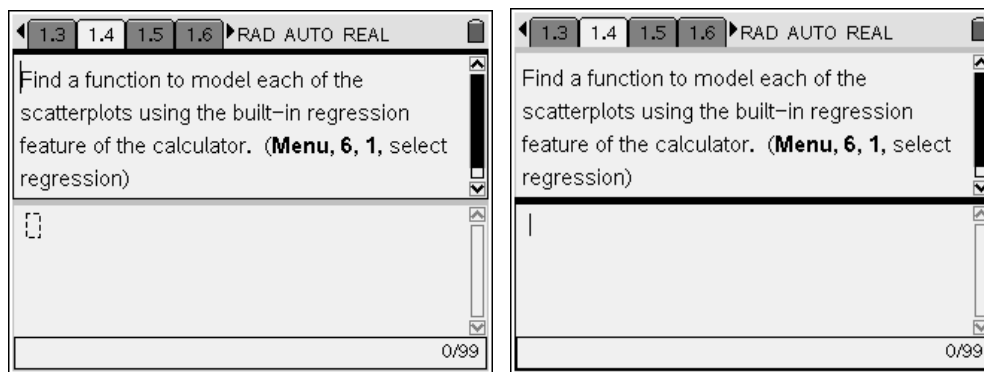
Remind the students how to move between pages.

- To move between pages, press **ctrl** and **←** or **→** on the NavPad.
- To scroll ahead or back several pages in a document, press **ctrl** and **▲** to view the Page Sorter view of the document. Use the NavPad to move to the desired page and press the center click key **⌘** to open the page.



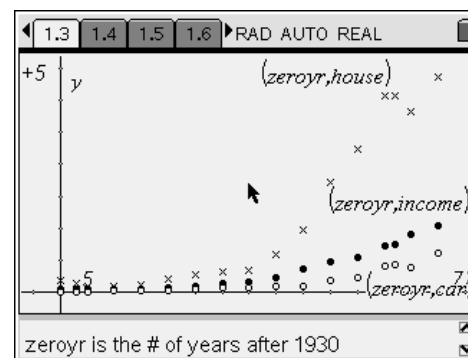
Remind the students how to move between applications on a page.

- To toggle between applications on a single page, press **ctrl** **tab**.

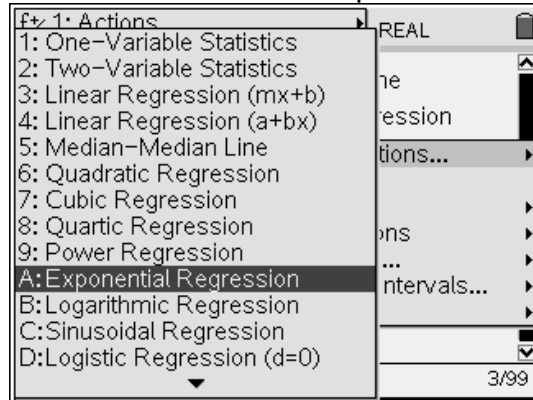


Page 1.2 explains the data that will be used in this activity. The data was collected from magnets purchased at <http://rememberwhenmagnets.com> and contains select years between the years 1930 and 2000. The students are instructed to look at the numerical values on the spreadsheet on page 1.2, thinking about the type of function that will best model the information related to the year.

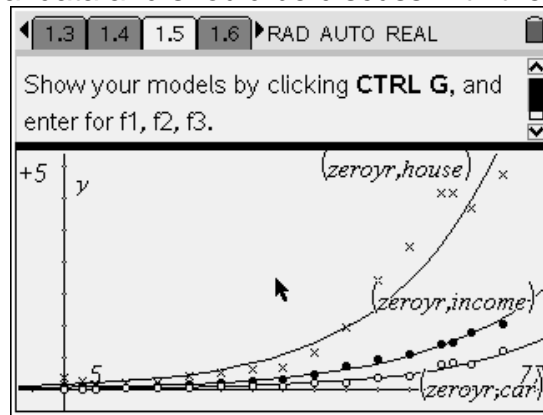
Page 1.5 contains the scatter plots of the data in the spreadsheet. Note, the independent variable is the number of years after 1930. Depending on their previous experiences, students will recognize the exponential growth pattern in the data. During group discussions, the teacher should point out the variability in the exponential growth and discuss possible reasons for it.



Page 1.6 instructs students to model each scatter plot using the built-in regression feature of the Calculator application. These exponential regression functions will be stored in **f1**, **f2**, and **f3** to be used on the next Graphs & Geometry page.



Page 1.8 instructs students to show the models on the scatter plots. This reinforces the variability of the numerical data and should be discussed with the class as a group.



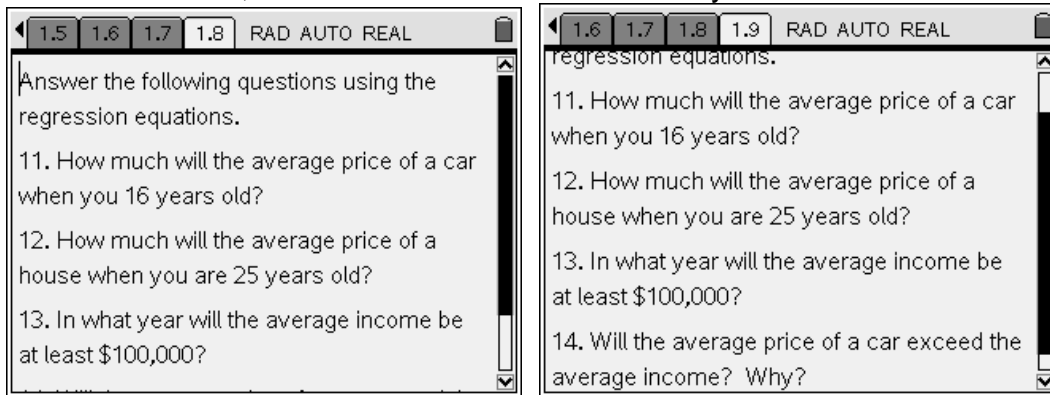
The questions on page 1.9 onwards are intended to focus students on their decision to use an exponential model. Teachers should expect students to refer to the percent change from year to year, inflation, and market values.

The questions on page 1.19 onwards are intended to help students realize that exponential functions do not have a constant slope or rate of change. It is expected that students add a calculator page to perform the calculations using the function **f1**.

$f1(0)$	1281.59
$f1(21)$	3723.51
$3723.5062953915 - 1281.585962643$	
	2441.92

$3723.5062953915 - 1281.585962643$	
	2441.92
$f1(1990-1930)$	26989.1
$f1(2011-1930)$	78413.9
$78413.907140612 - 26989.121192511$	
	51424.8

The questions on page 1.19 onwards are intended to help students think about the projected price of a car and house at an age they would be purchasing them. Question 15 is intended to help students gain a deeper understanding by asking the question in terms of the output of the function. Students could use the calculator page to “guess-and-check” or use a trace point on the graph of  $f_1$  and move to the approximate location of the answer. Question 16 is intended to focus students on the relationship between two of the exponential models. The groups should be lead to discuss the percent growth of each model, but cautioned about the reliability of models far into the future.



If the document is used with students working in groups, there are times the teacher should host a class discussion to ensure key components of an exponential function are explored. This should be done after each page of questions and possibly others as the groups are being monitored working the activity.