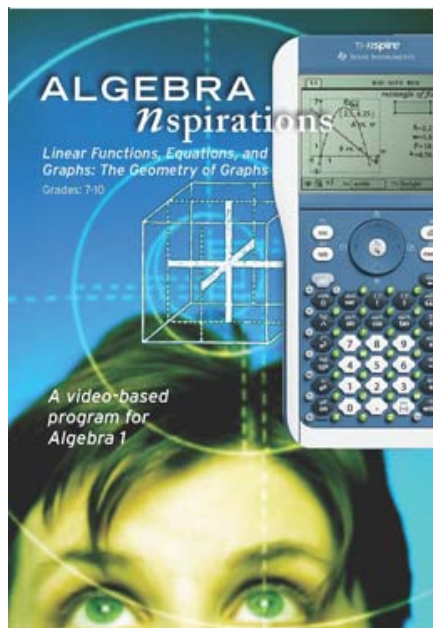




ALGEBRA NSPIRATIONS

Linear Functions: The Geometry of Graphs



Teacher's Guide

Series Overview

For Algebra 1 teachers looking for a video resource that uses graphing calculators, *Algebra Inspirations* provides an ideal solution. Each program in this series focuses on a key topic in algebra and uses real-world examples to explore these topics. In addition, all the relevant calculator keystrokes for the TI-*N*spire calculator are provided. In addition, Math Labs allow for hands-on exploration of these topics.

Program Overview
















In this program TI graphing calculators are used to explore the nature of linear functions. Examples ranging from air travel, construction, engineering, and space travel provide real-world examples for discovering algebraic concepts. All examples are solved graphically and then reinforced through the use of the TI-*N*spire calculator. Algebra teachers looking to integrate hand-held technology to their instruction will benefit greatly from this series.

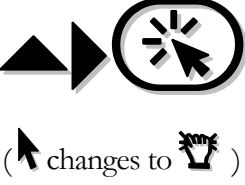












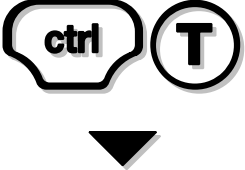
Concepts explored: Standard form, slope-intercept form, point-slope form, solving linear equations

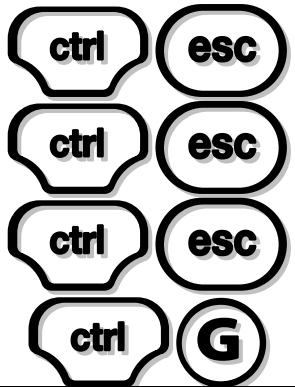
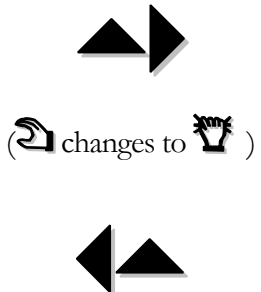
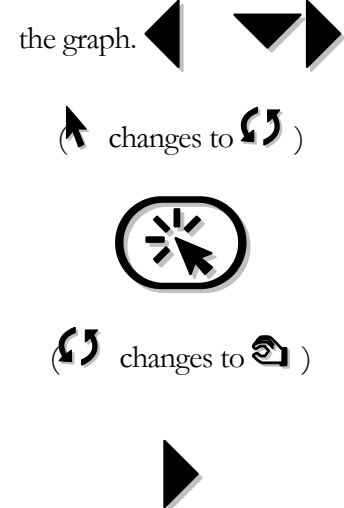


Grades: 7-10







Investigation 1

In this part of the program, students investigate equations and graphs of the form $y = ax$. Students input a function, graph it, and modify the window to isolate the first quadrant. They then look at a function table based and analyze its data.

TI- <i>N</i> spire Keystrokes	
Turn on the <i>N</i> spire.	
Press the home key followed by 6, or ctrl N to open a new document.	  OR  
A previous document may be open: if so, a prompt will ask if you wish to save the document. Click to choose “yes” or press tab then click to choose “no.”	 OR  
Select 2 to create a Graphs and Geometry Page.	
The blinking cursor is on the function entry line, by f1(x) . Type in 1.5x.	   
Press enter to graph.	
Press esc to move to the work area.	

<p>Isolating the first quadrant: Move the pointer arrow to a clear area of quadrant one. Then press the Click button and hold it down until the pointer changes to a grasping hand. Use the Navigation Pad to drag the origin to the bottom left corner of the monitor, such that both x- and y-units are visible. Press esc to exit the grab-and-drag feature.</p>	 <p>( changes to )</p> 
<p>To increase the y-max to about 45 move the pointer to a tick mark on the y-axis. The tick marks on both axes start blinking and the pointer becomes an open hand. Press and hold the Click button until it becomes a closed hand. Press and hold the SHIFT key, while pressing the DOWN ARROW on the NavPad, changes the y-scale, leaving the x-scale intact. Select a y-max of about 45. Press esc to exit grab-and-drag.</p>	 <p>( changes to )</p>  
<p>Press menu, 5, and 1 for the Graph Trace tool.</p>	
<p>Press the right arrow on the NavPad to trace the graph and display the coordinates of the points along the way.</p>	
<p>To skip ahead to $x = 5$, press 5, then enter.</p>	
<p>Press ESC to exit TRACE mode.</p>	
<p>Press ctrl T to bring up the function table on the same screen. Scroll down the $f_1(x)$ column using the NavPad and stop at 36. Notice that the corresponding x-value is 24.</p>	

<p>Press ctrl and ESC three times to exit the split screen and return to the graph. Press ctrl and G to hide the function entry line.</p>	
<p>Hover over the text of the equation with the pointer; click and hold until the open hand becomes a closed hand. Use the left and up arrows to drag the equation to the top left corner. Then press Esc.</p>	
<p>Next, move the pointer over the graph of the line near the top of the screen. The pointer changes to two curved arrows. This feature allows us to rotate the line around the y-intercept. Click and hold until the arrow turns into a closed hand. Use the arrows on the NavPad to rotate the line. Do so slowly to see the changes in the slope value.</p> <p>Stop the rotation of the line at a slope value of about -2.</p>	<p>Use these keys to move the pointer over the graph.</p> 
<p>Press Esc to exit graph rotation mode.</p> <p>Move the pointer over the graph near the origin until the pointer changes to a cross with arrows. This feature allows us to</p>	 

<p>translate the line and create parallel lines.</p> <p>Click and hold until the arrow turns into a closed hand. Now use the right arrow on the NavPad to shift the line slowly to the right.</p> <p>Notice that the slope remains unchanged, while the y-intercept changes. Stop at about $f_1(x) = -2x + 40$</p>	<p>( changes to )</p> <p></p> <p>( changes to )</p> <p></p>
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Assessment

Graph the following linear functions.

- | | | |
|--------------|----------------|--------------|
| 1. $y = 5x$ | 3. $y = -2.5x$ | 5. $y = 0$ |
| 2. $y = -3x$ | 4. $y = 5$ | 6. $y = -9x$ |

For each function use TRACE to find the value of y for the given x .










- | | |
|-----------------------------|-------------------------|
| 1. $y = 2x$ for $x = 4.5$ | 5. $y = 0$ for $x = 17$ |
| 2. $y = -7x$ for $x = 8.1$ | 6. $y = -9$ for $x = 0$ |
| 3. $y = 4.5x$ for $x = 1.2$ | |
| 4. $y = -1.8x$ for $x = 15$ | |

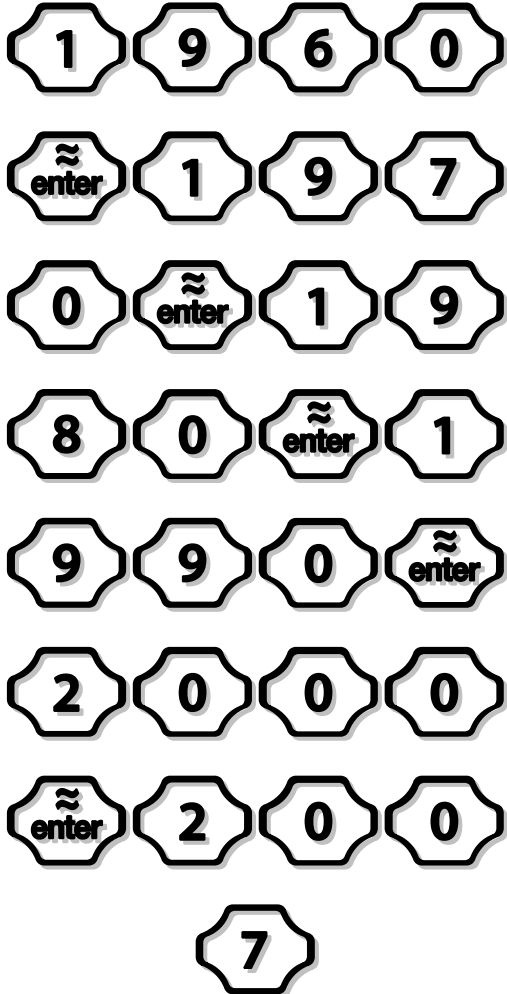
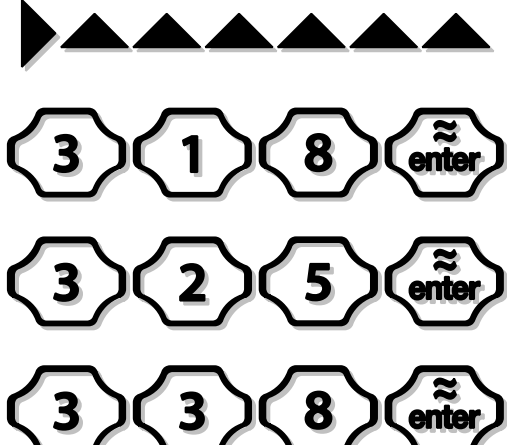
For each function use a List and Spreadsheet window to find the value of y for the given x .

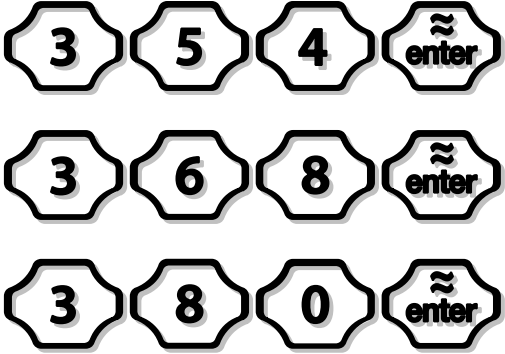
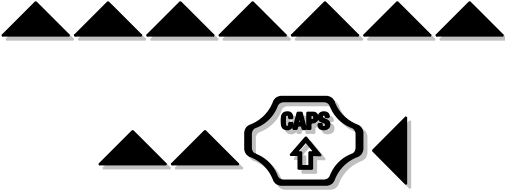
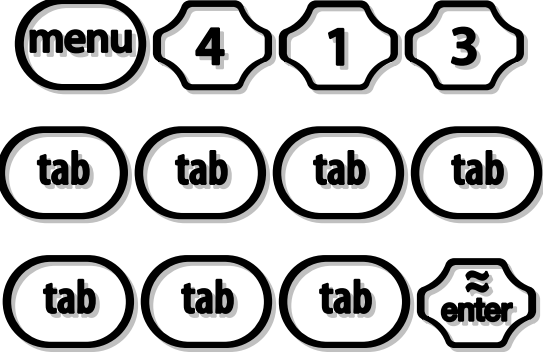
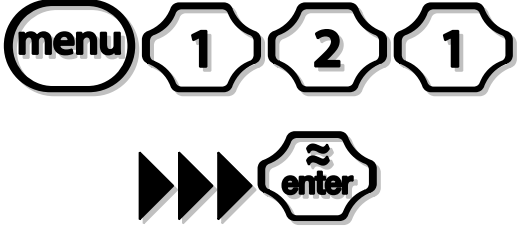

- | | |
|-----------------------------|-----------------------------|
| 1. $y = 5x$ for $x = 4.5$ | 4. $y = -1.8x$ for $x = 15$ |
| 2. $y = -7x$ for $x = 8.1$ | 5. $y = 0$ for $x = 17$ |
| 3. $y = 4.5x$ for $x = 1.2$ | 6. $y = -9$ for $x = 0$ |

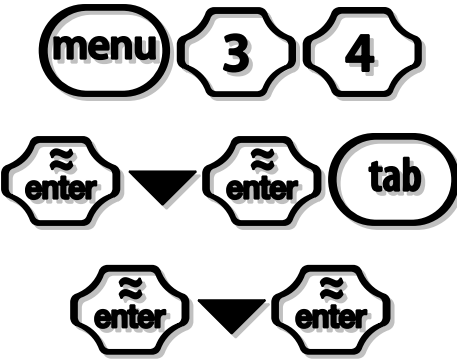

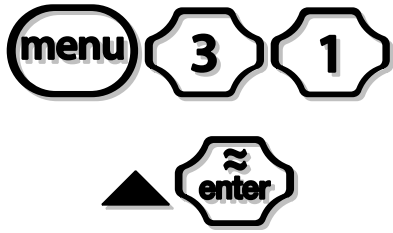
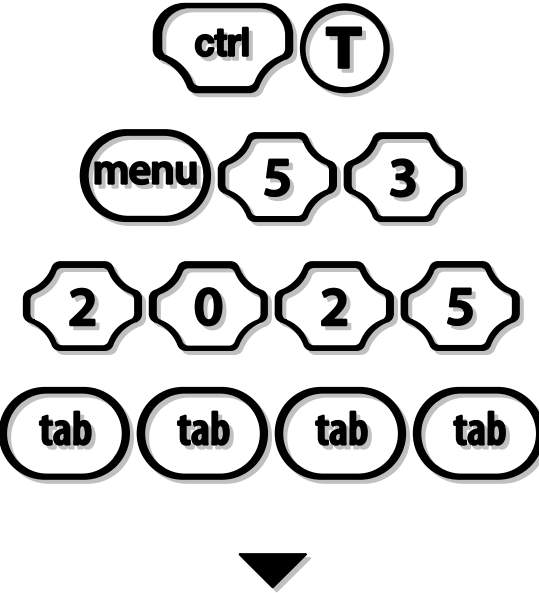
Investigation 2

In this part of the program, students investigate data related to global warming. Students perform a linear regression on a data set.

TI- <i>n</i> spire Keystrokes															
Turn on the <i>n</i> spire.															
Press the home key followed by 6, or ctrl N to open a new document.	 OR 														
A previous document may be open: if so, a prompt will ask if you wish to save the document. Click to choose “yes” or press tab then click to choose “no.”	 OR 														
Press 3 to insert the Lists and Spreadsheet application.															
Input the following data into the spreadsheet. Start by entering the column headings.	  														
<table border="1"> <thead> <tr> <th>Year</th> <th>CO₂</th> </tr> </thead> <tbody> <tr> <td>1960</td> <td>318</td> </tr> <tr> <td>1970</td> <td>325</td> </tr> <tr> <td>1980</td> <td>338</td> </tr> <tr> <td>1990</td> <td>354</td> </tr> <tr> <td>2000</td> <td>368</td> </tr> <tr> <td>2007</td> <td>380</td> </tr> </tbody> </table>	Year	CO ₂	1960	318	1970	325	1980	338	1990	354	2000	368	2007	380	
Year	CO ₂														
1960	318														
1970	325														
1980	338														
1990	354														
2000	368														
2007	380														

<p>Enter the years in column A, pressing enter after each entry.</p>	
<p>When you're done, use the NavPad to move to column B, where you'll enter the CO2 levels.</p>	

	
<p>Before performing a linear regression, you must select the data: use the NavPad to move the cursor to the top of column B, beside the letter B. Press the up arrow once more to select column B. It should now be highlighted. Then, press and hold the SHIFT key while pressing the left arrow. Now both columns should be selected.</p>	
<p>Next, press menu, 4, 1, and 3 to select linear regression. Press tab to move all the way down to OK and press enter or Click.</p>	
<p>Your cursor lands on entry one of column D. To widen the column, press menu, 1, 2, and 1 followed by the right arrow a few times until the width is satisfactory. Then press enter.</p>	
<p>To plot the six data points and the regression line together, press ctrl and I, then 2 to insert a new graph page.</p>	

<p>Press menu, 3, and 4 for scatter plot. Press enter and the down arrow to select stat.xreg. Press on the Enter button. Next, push tab to move to the y variable and likewise select stat.yreg.</p>	
<p>Select Zoom-Data by pressing menu, 4 and 9.</p>	
<p>To plot the regression line over the points, press menu, 3 and 1. Press the up arrow to access f1, and finally press enter.</p>	
<p>Press ctrl T for the function table and menu 5 and 3 to change the table start value to 2025. Tab down to select OK. Use the NavPad to scroll down to 2050 and find 435.85 ppm.</p>	

Assessment

Perform a linear regression on the data set. Graph the data and the linear function.

1. The value of a new car decreases over time. The data below shows the value of a car over a five-year period.

Year	Price
1	25,000
2	22,500
3	20,000
4	17,750
5	15,000

2. The value of an antique car increases over time. The data below shows the value of a car over a five-year period.

Year	
1	35,000
2	37,500
3	41,000
4	43,000
5	45,000