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TI-*nspire*

Linear Regressions

Walk the Line
by John Hinojosa

Activity Overview

In this activity, students will count the number of steps required to walk a given distance. Each student will record their data. The students will then create a graph (scatter plot) of their data.

Concepts

- Collecting data in a spreadsheet

- Creating a scatter plot of the data

- Determining the linear regression that best fits the data.

TI-Nspire Applications

Lists and Spreadsheets
Data and Statistics
Calculator

Materials needed:

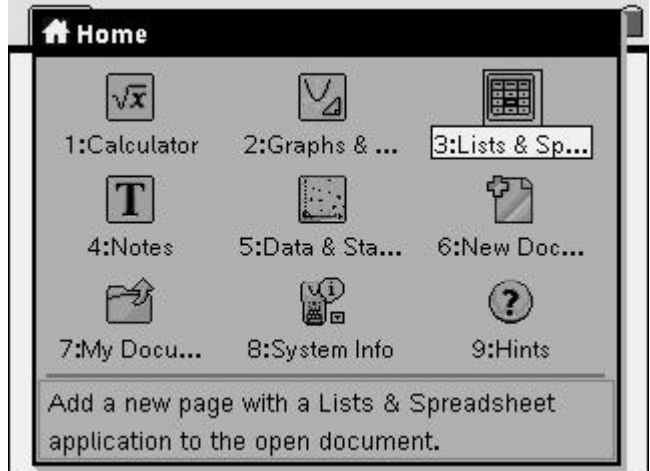*TI Nspire calculator*
Masking tape
Measuring tape (at least 50 ft.)


Step-by-step directions:

Students will work in pairs. Each student will begin to walk the line (measuring tape). Student partner will record how many steps the student takes to reach each marked measurement.

Once each student has recorded their data, they will enter the data using the List and Spreadsheets in the TI-Nspire.

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Press the "Menu" button and open a new **Lists and Spreadsheets** document

Home

$\sqrt{x}$
1:Calculator

$\bigvee_{\triangle}$
2:Graphs & ...

3:Lists & Sp...

T
4:Notes

5:Data & Sta...

6:New Doc...

7:My Docu...

8:System Info

?
9:Hints

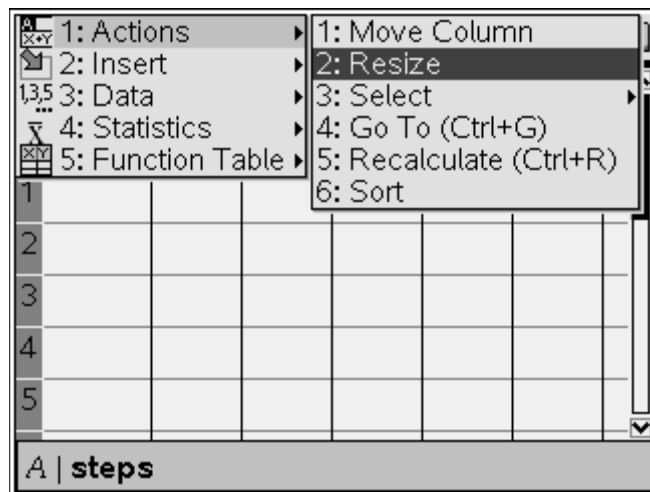Add a new page with a Lists & Spreadsheet application to the open document.

You will use the "Nav Pad" to move the cursor up to the text box next to the letter "A" in the first column. You will now label the column "steps"

1.1				RAD AUTO REAL		
A st...	B	C	D	E	F	
◆						
1						
2						
3						
4						
5						

A | **steps**
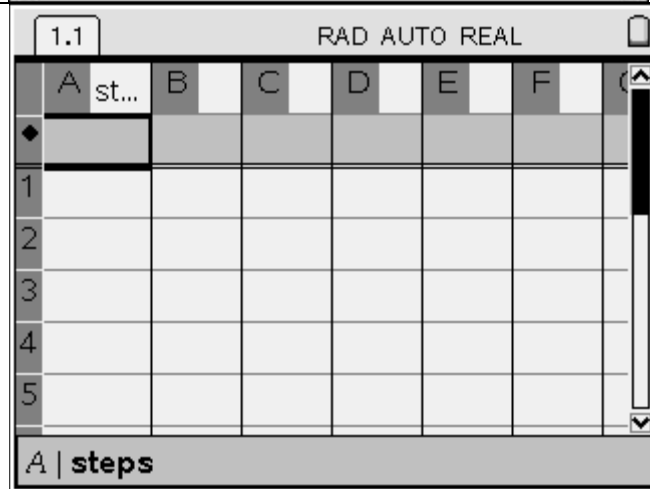
If you want to resize the row, click on the menu button, select "Actions", 2:Resize, and then 1: Resize Column Width.
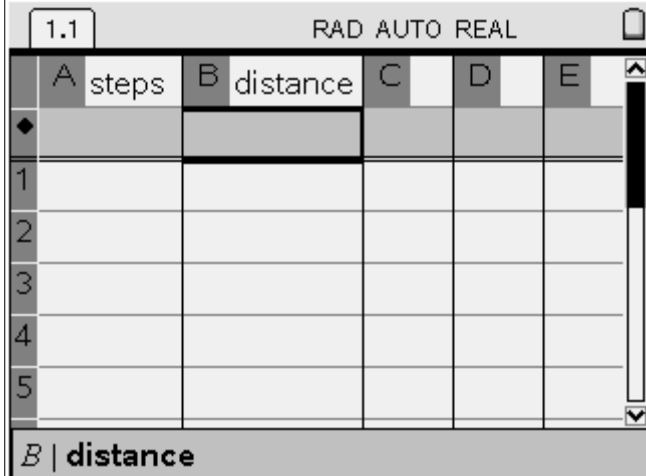
Then press the right side of the "Nav pad" to widen the column.
Once set to desired size, click the middle of "Nav pad" and then press bottom of "Nav pad."
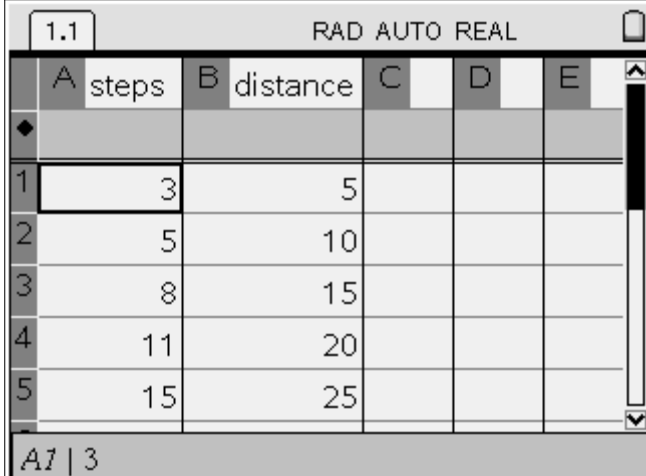
1: Actions	▶	1: Move Column
2: Insert	▶	2: Resize
3: Data	▶	3: Select ▶
4: Statistics	▶	4: Go To (Ctrl+G)
5: Function Table	▶	5: Recalculate (Ctrl+R)
		6: Sort

1
2
3
4
5

A | **steps**

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You will need to use the "Nav pad" to move the cursor to the text box next to the letter "B". Label the column "distance"

Resize as needed.

1.1			RAD AUTO REAL		
A steps	B distance	C	D	E	
◆					
1					
2					
3					
4					
5					

B | **distance**

The student will now enter their data in the spreadsheet. The following screens will show sample data. Students will follow the next steps using their data.
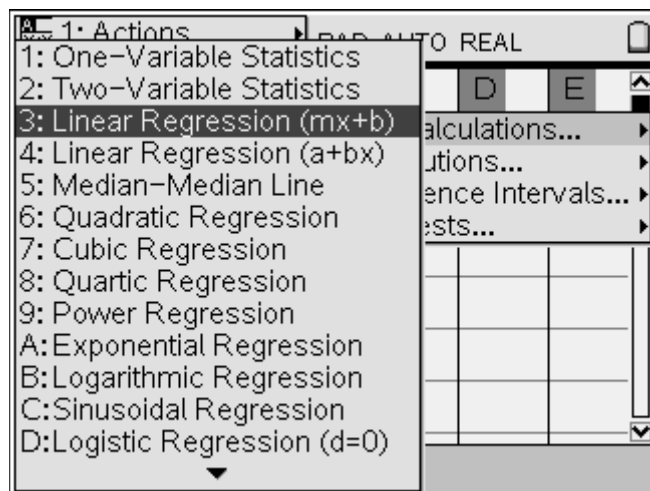
1.1			RAD AUTO REAL		
A steps	B distance	C	D	E	
◆					
1	3	5			
2	5	10			
3	8	15			
4	11	20			
5	15	25			

$A1$ | 3

Discovery Question:
Does the data show any type of relationship?

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Now we will calculate a linear regression.

While in "Lists and Spreadsheet", press the (menu) button. Select "4: Statistics", "1: Stat Calculations" and then select Linear regression (mx+b).

1: Actions ▶	RAD AUTO REAL	🗀
2: Insert ▶	nce C D E	
3: Data ▶	1: Stat Calculations... ▶	
4: Statistics ▶	2: Distributions... ▶	
5: Function Table ▶	3: Confidence Intervals... ▶	
	4: Stat Tests... ▶	

1	3	
2	5	10
3	8	15
4	11	20
5	15	25

B1 | 5

1: Actions ▶ RAD AUTO REAL 🗀
1: One–Variable Statistics
2: Two–Variable Statistics
3: Linear Regression (mx+b)
4: Linear Regression (a+bx)
5: Median–Median Line
6: Quadratic Regression
7: Cubic Regression
8: Quartic Regression
9: Power Regression
A: Exponential Regression
B: Logarithmic Regression
C: Sinusoidal Regression
D: Logistic Regression (d=0)

You will now select the parameters of the linear regression.

On the "X List:" press down with your "Nav pad" and select "steps".

Tab to the next item "Y List:". Again press down with your "Nav pad" and select "distance"

Tab to the next item "Save RegEqn to:" and make sure *f1* is selected.

Tab to the last item, "1st Result Column" and make sure that "c[]" is selected.

Linear Regression (mx+b)

X List: steps ▽
Y List: distance ▽
Save RegEqn to: f1 ▽
Frequency List: 1 ▽
Category List: ▽

OK   Cancel

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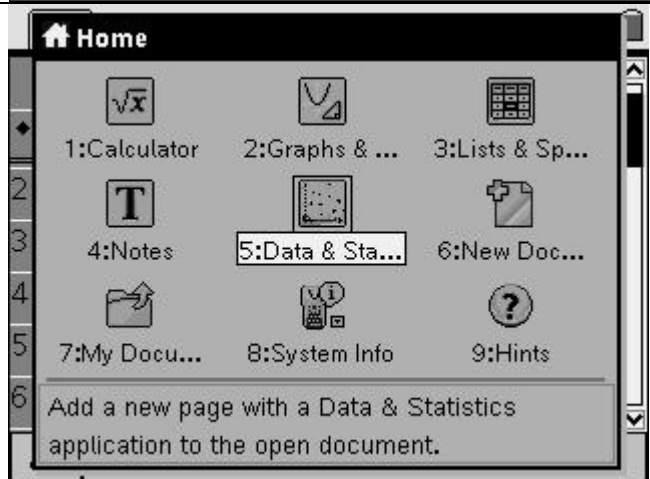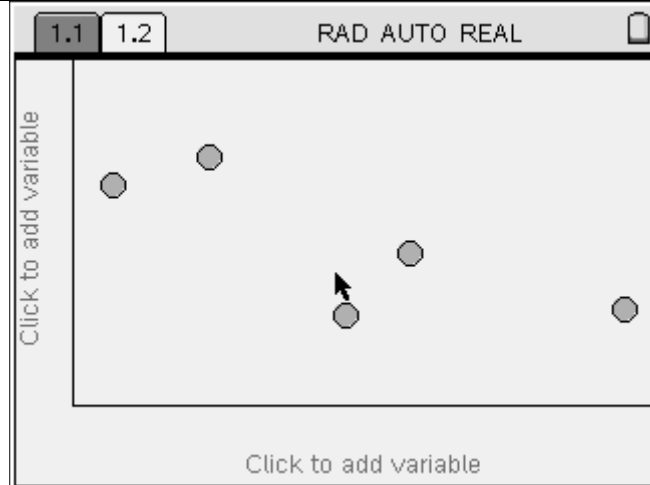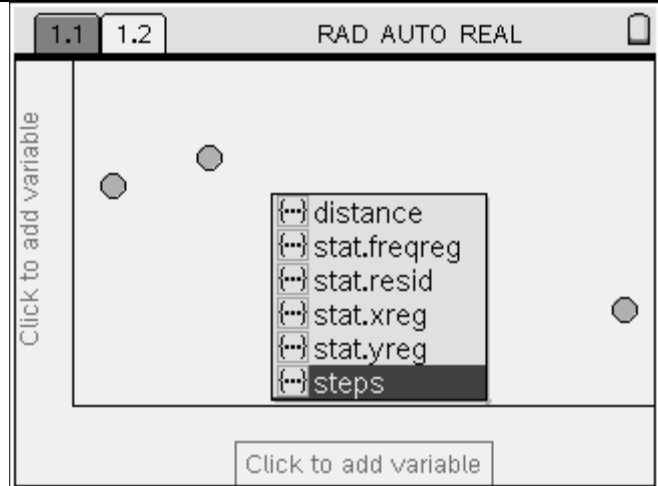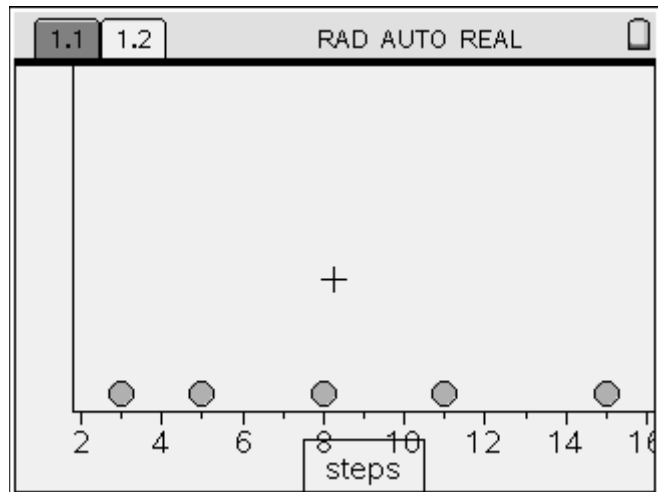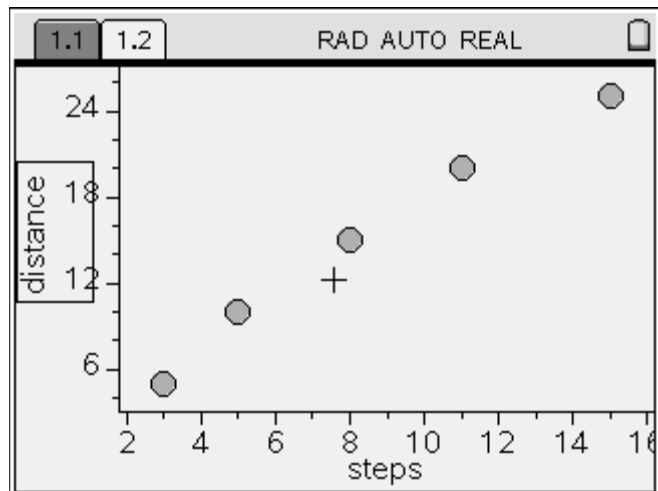|	
Select "OK" and your Linear Regression Equation will be listed and labeled using columns C and D. Once again, you may resize column widths.	
We will now select the Home button and add a new page with a "Data and Statistics" Application to the open document.	
We now need to select the variables we wish to plot on the graph. Use the "Nav pad" to move the cursor toward the bottom, middle of the screen (x axis).	

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When "Click to change variable" appears select "steps".

RAD AUTO REAL

Click to add variable

distance
stat.freqreg
stat.resid
stat.xreg
stat.yreg
steps

Click to add variable

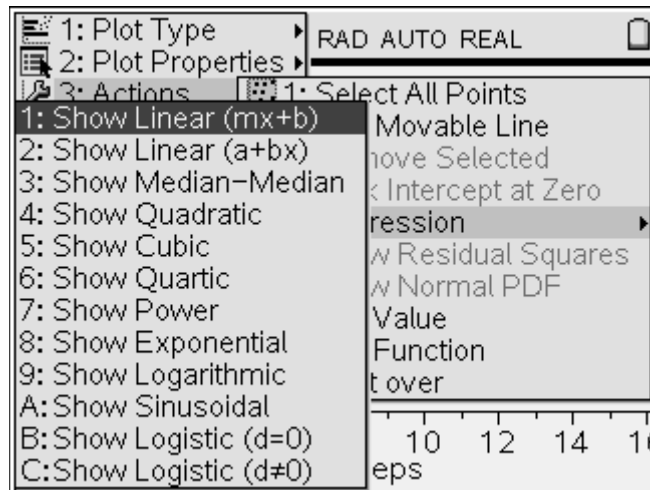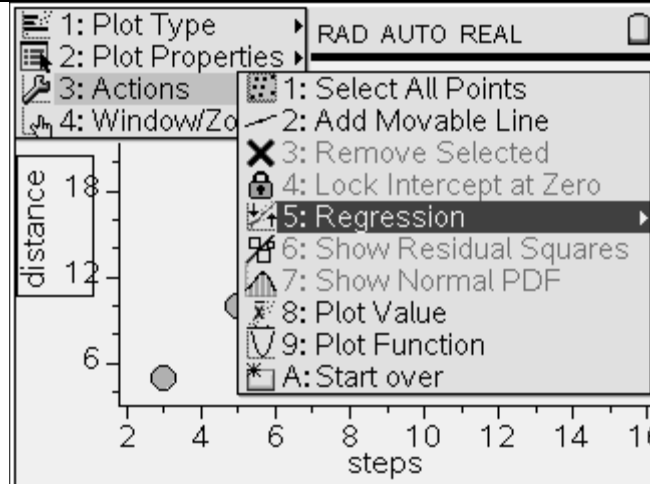You will now use the "Nav pad" to move the cursor the the "y axis".

RAD AUTO REAL

steps

Once again, when "Click to change variable" appears, select "distance".

You will now see your data points from your spreadsheet plotted.

RAD AUTO REAL

distance

steps

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At this point, select "Menu" button and scroll down (using your "Nav pad") to "3: Actions", select "5:
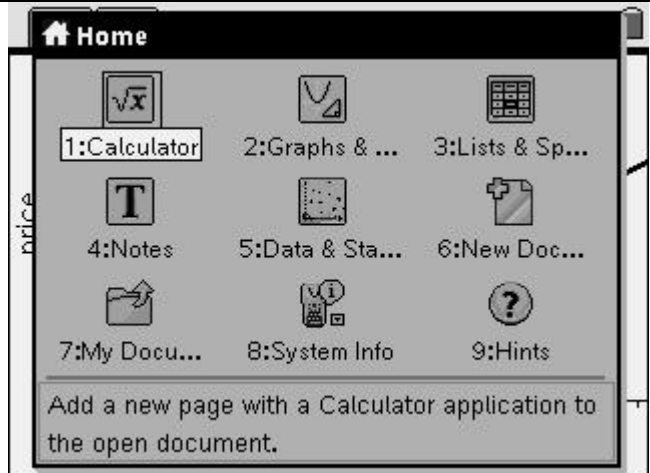Regression" and then "1: Show linear (mx + b).

1: Plot Type	▶	RAD AUTO REAL
2: Plot Properties	▶	
3: Actions	1: Select All Points	
4: Window/Zo	2: Add Movable Line	
	3: Remove Selected	
	4: Lock Intercept at Zero	
	5: Regression	▶
	6: Show Residual Squares	
	7: Show Normal PDF	
	8: Plot Value	
	9: Plot Function	
	A: Start over	

1: Plot Type   RAD AUTO REAL
2: Plot Properties
3: Actions   1: Select All Points
1: Show Linear (mx+b)   Movable Line
2: Show Linear (a+bx)   nove Selected
3: Show Median−Median   Intercept at Zero
4: Show Quadratic   ression
5: Show Cubic   w Residual Squares
6: Show Quartic   w Normal PDF
7: Show Power   Value
8: Show Exponential   Function
9: Show Logarithmic   t over
A: Show Sinusoidal
B: Show Logistic (d=0)
C: Show Logistic (d≠0)

Your regression is now plotted along with your data points.

$y = 1.64{*}x + 1.18$
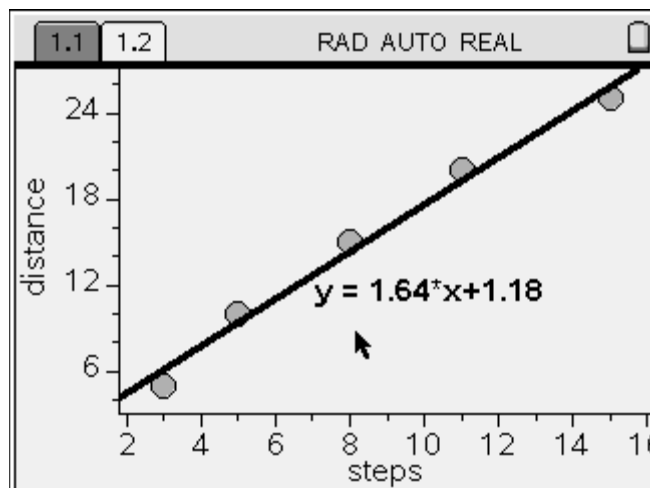
Discovery Question:
Does the "Linear Regression" model the data points? Why or why not?

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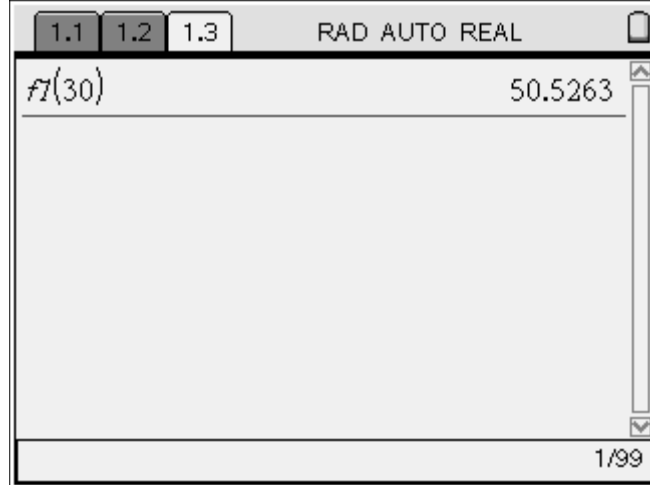
We will now select the "Home" button and add a new page with a "Calculator" Application to the open document.	**Home** 1:Calculator 2:Graphs & ... 3:Lists & Sp... 4:Notes 5:Data & Sta... 6:New Doc... 7:My Docu... 8:System Info 9:Hints Add a new page with a Calculator application to the open document.
You can know use the linear regression equation saved in f1 to "guess" what the distance would be if you took a certain number of steps. In the Calculator application, type $f1(30)$ and press to calculate "guess".	1.1 1.2 1.3 RAD AUTO REAL $f1(30)$ 50.5263 1/99
Discovery Question: What other types of Regression Equations might model this data more accurately? Why? Questions to Answer? 1. What does the graph represent? 2. How would you describe the graph? 3. What are the variables in this problem? 4. Which is the independent variable? And... which is the dependent variable? 5. Using the data, could you predict how many steps you would take when walking 30 feet? 60 feet? 6. Why would your data be different from one of your fellow students?	