Grade level: secondary
Subject: mathematics
Time required: 45 to 60 minutes

TI-*nspire*™

TI-Nspire Activity: *Tipping Point Lab*
By: Leigh T Baker adapted from a TFAS activity

Activity Overview
This lab is designed to allow students to collect data whose model will be (or should be) a linear regression.

Concepts
Measurement-reading a ruler
Recording data
Constructing a scatter plot
Recognizing a linear graph
Calculating the correlation coefficient

Teacher Preparation
Prior to the activity, the teacher needs to assemble all materials needed.
Materials Needed: *Each team needs 10 pennies, one ruler, and a flat desk top*
                         Copy of .pdf worksheet for each student

The Classroom.
Begin the classroom activity by discussing how a linear function graph looks.
Also remind students how to read a ruler.

Generate Data

1. Place the ruler on the edge of the a desk with the end marked **0** extending over the edge of the desk. The readings should be in centimeters.

2. Place one penny on the end of the ruler that is extending out past the desk.

3. Use a pencil to gently push the ruler toward the end of the desk until it starts to dip.

4. Record the length the ruler extends over the edge of the desk at the tipping point.

5. Record your data on the student worksheet.

6. Repeat the process using from two to ten pennies.

7. Enter the data into the table on the student worksheet.

Record data on TI-Nspire handheld

1. Press ⌂6 to create a new document. Select **3: Add Lists & Spreadsheet**.

2. Label column A **Pennies** to represent the number of pennies and Column B **Length** to represent the length measured on the ruler.

3. Cursor to cell A1, and enter a 1; at cell A2 enter a 2; continue until you have reached 10.

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4. Cursor right to column B and enter the length data from your table. (*The data in the screenshot below is an example.*)

A pennies	B length	C	D
1	1.1		
2	2.2		
3	3.3		
4	4.4		
5	5.5		
6	6.6		

A1 | 1

Graph Data

1. Press ⌂ and select 5: Add Data and Statistics.

2. Using the NavPad, cursor to the bottom of the screen and press ↵. A popup window will appear.

Caption: length
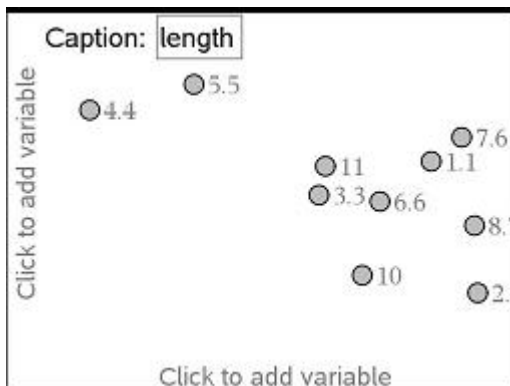
Select the appropriate heading for the x-axis.
Is this axis independent or dependent? Explain.

3. Repeat the above process by using the NavPad to move to the left of the screen and press ↵. Is this axis independent or dependent? Explain.

4. A scatter plot representing the data appears on the screen. Which of the following correlations best describes the graph of the data?
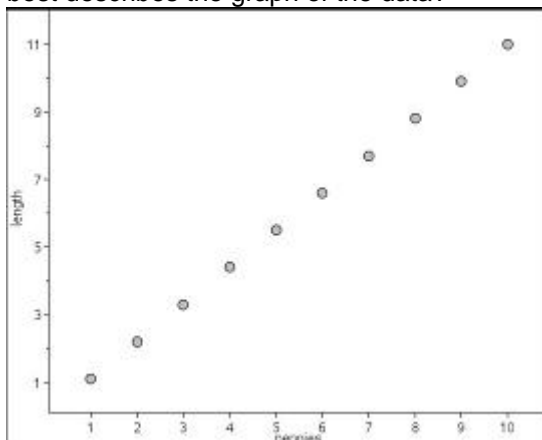
Weak, positive correlation
Strong, positive correlation
Weak, negative correlation
Strong, Negative correlation
No correlation
Explain how you came to this conclusion.

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Graph a Trend Line

A trend line is a line that approximates the relationship between data sets for a scatter plot. Trend lines are used to make predictions.

1.   Press (menu) 4:Analyze, 2:Add Moveable Line

2.   Using the NavPad, move the line so that it best fits your data points.
        You should have about the same number of data points both below and above the line.

        What equation do you think best fits your data? Record it.
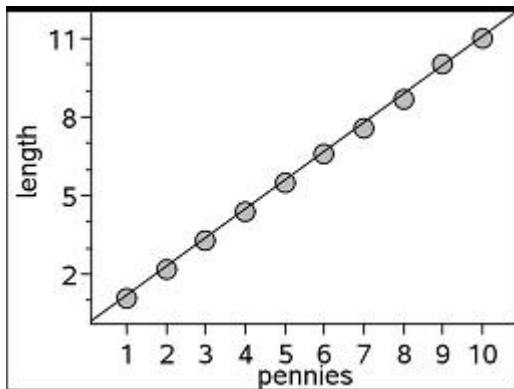
Graph a Regression Line

1.   Press (menu) 4:Analyze, 6:Regression, 1:Show Linear (mx+b). What do the **m** and **b** represent?

2.   Compare and contrast your trend line with the regression line. Record the Regression line equation.

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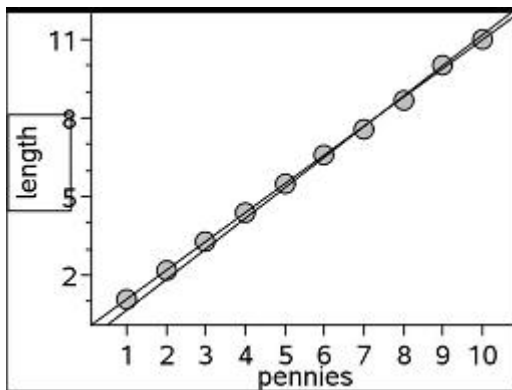
3.   Use Lists and Spreadsheets to find more information about the regression line.
Use (ctrl) ▲to get a thumbnail of all pages. Highlight page 1.1 and press (enter).
Tab over to the last column used, and highlight cell B1. Press (menu) 4:Statistics, 1:Stat
Calculations, 3:Linear Regression (mx+b).
Enter the appropriate X-list and Y-list variables, and (tab)▼ to close the window.
The linear regression information appears in Columns C and D.

A pennies	B length	C	D
◆			=LinR(
1	1.1	Title	Linear
2	2.2	RegEqn	m*x+b
3	3.3	m	1.099
4	4.4	b	-0.006(
5	5.5	r²	0.999
6	6.6	r	0.9998

A1 | 1

4.   The NSpire gives the correlation coefficient r, which tells how closely the equation models the
data.
What is the correlation coefficient for your data?
A correlation coefficient close to 1 or -1 is good.

5.   What type of line would have a correlation coefficient close to -1?
When would the correlation coefficient be close to 1?

6.   What is the difference between a trend line and a line of best fit?

Make Predictions

1.   Predict how many pennies you think that you can stack before running out of ruler.

2.   Use the regression equation to predict how many pennies it would take to obtain 18.5 cm(the
length of a 12 inch ruler)?

3.   Check your guess. Press (⌂) 1:Calculator to insert a calculator page.
Press (x)(:)(=)(1)(8)(.)(5) to save the value 18.5 as the variable x.
Type in the right side of you regression equation and press (enter).

4.   How close was your estimate?
Was it reasonable? Turn to your partner and explain.