Chirp, Jump, Scatter

ID: 11514

Time Required
15 minutes

Activity Overview

In this activity, students will find a best fit line for data graphed as scatter plots. Applications of linear relationships provide motivation for students and improve their skills and understanding of finding the equation of a line from two known points. Movable lines make this activity approachable for Algebra 1 students. Students can put into practice what they have learned with extension/homework questions.

Topic: Equation of a line

- *Scatter plots, best fit line*
- *Application questions for writing an equation of a line from two points*

Teacher Preparation and Notes

- *This activity has students calculate the equation of a line using two points. You may give students the option to use **Manual-Fit** instead which calculates the equation for them.*
- *Be sure to send the program **SCATTER** to each student's graphing calculator before beginning the activity.*
- *Data for the Summer Olympics High Jump is from* databaseOlympics.com*. Data for brain size and IQ is from* http://lib.stat.cmu.edu/DASL/Datafiles/Brainsize.html.
- ***To download the student worksheet, go to education.ti.com/exchange and enter "11514" in the keyword search box.***

Associated Materials

- *ChirpJumpScatter_Student.doc*
- *SCATTER.8xp (program)*

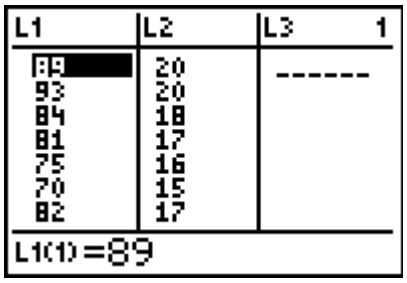
Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.

- *Finding a Line of Best Fit (TI-84 Plus family) — 8192*
- *Catch a Thief with a Scatterplot (TI-Nspire technology) — 9221*

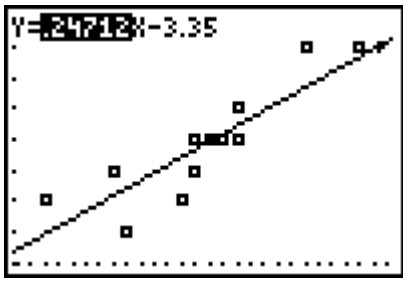
Problem 1 – Chirps in 15 Seconds vs. Temperature (°F)

Students are asked to look at the data of temperature (in °F) and the number of cricket chirps in 15 seconds and determine if they can see a relationship by only looking at the data.



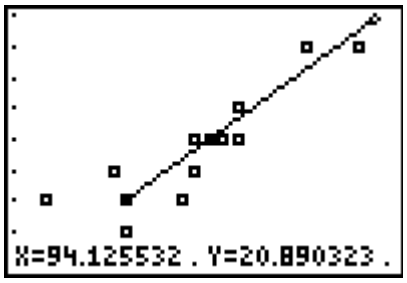
Because the data isn't in order and the same number of chirps occurred for different temperatures, it is difficult to see the pattern from a list of the data. But from the graph a trend is discernable.

Students create their own line of best fit by using the method outlined in the student worksheet.



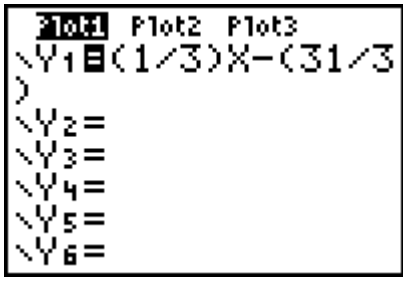
> Another option for students to find the line of best fit is using the **Manual-Fit** command. This command allows students to place two points on the graph creating the line and then the calculator displays the equation of the line in the top-left corner of the screen.
>
> Press [STAT] and in the CALC menu select **Manual-Fit** to use this feature.

When students begin adjusting their line of best fit, caution them to look at the window settings so that they might observe the scale of the graph – what the student believes to be a small change could very well be a large change depending, on the scale of the plot.



On the Home screen, students are to use the two points to find the equation of their line and then enter the equation next to **Y1**.

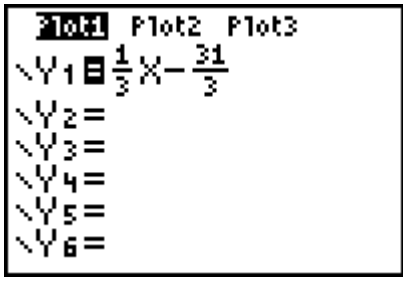
They will then use this equation to extrapolate their data and find the number of chirps when the temperature is 100 °F and 55 °F.



If using Mathprint OS:

Students can display fractions in the Y= screen. To do this, press [ALPHA] [F1] and select **n/d**. Enter the value of the numerator, press [▼], enter the value of the denominator.

Press [▶] to move out of the fraction. Parentheses are not needed around the numerator or denominator.

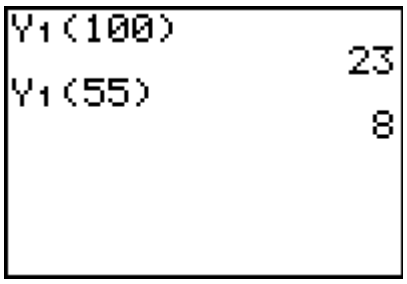


Possible solution:

Point 1: (76, 15) and Point 2: (94, 21) $\rightarrow y = \frac{1}{3}x - \frac{31}{3}$

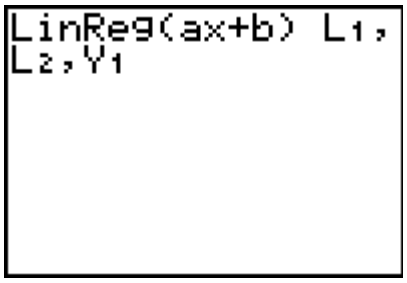
$y = \frac{1}{3}(100) - \frac{31}{3} \rightarrow y = 23$ chirps;

$y = \frac{1}{3}(55) - \frac{31}{3} \rightarrow \rightarrow y = 8$ chirps



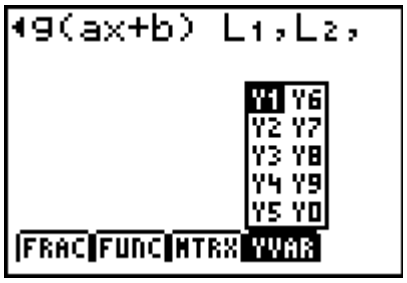
If students have difficulty with the concept of a line of best fit, or their drawn line is a poor fit, their scatter plot can be easily used to graph a statistical linear regression. Press [STAT] and in the CALC menu select **LinReg(ax+b)**. Then enter **L1, L2, Y1**.

This could also be used to show how good a simple approximation can be.



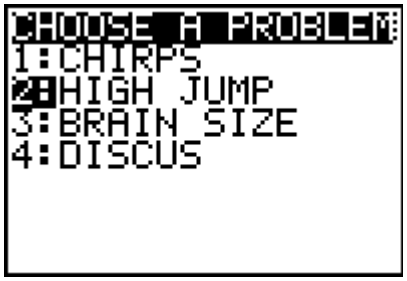
If using Mathprint OS:

Students can use the shortcut menus to enter Y1. To do this, press [ALPHA] [F4] and select **Y1**.



Problem 2 – Olympic High Jump

The process is repeated for the high jump. A trend of increasing height from the data is observable in both the Stat Editor and the scatter plot.

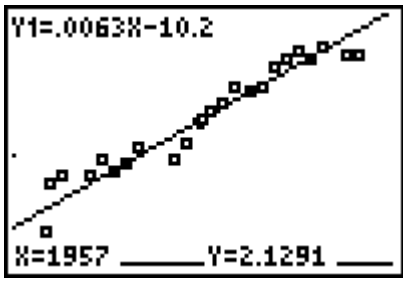


Possible Solution:

Point 1: (1904, 1.8) and Point 2: (2000, 2.4)
$\rightarrow y = 0.0063x - 10.2$

When $x = 2012$, $y = 2.4414$ meters.

Again, if students have difficulty with the concept of line of best fit, or their drawn line is a poor fit, their scatter plot can be easily used to graph a statistical linear regression.

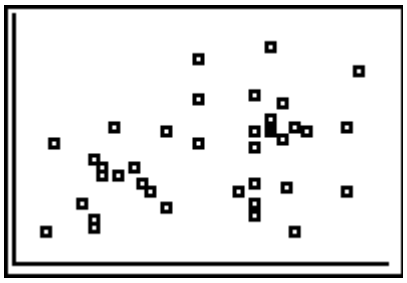


Problem 3 – Brain Size vs. IQ

For more information about the units and how this data was collected, see the following website:

http://lib.stat.cmu.edu/DASL/Datafiles/Brainsize.html

No appropriate line of best fit can be drawn. Men do appear to generally have bigger brains, but not higher IQs.

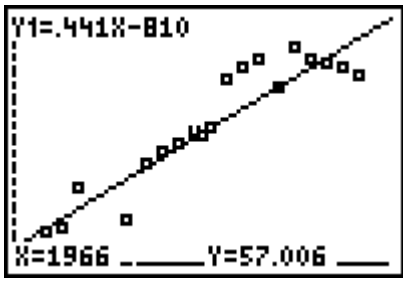


Extension/Homework

Problem 1 – Women's Olympic Discus Throw

This open-ended question gives the students another data set to explore.

They are to find the equation of the line of best fit. Make a prediction for a future Olympic year and discuss how reasonable it is.



Problem 2 – Handshake

This example shows that not all data is linear. It is an application of triangular numbers. To see more about these numbers, see en.wikipedia.org/wiki/Triangular_numbers

Students are given a diagram of this handshake question on their worksheet and asked to "Draw on your paper what this would look like if there were 5 people in the room. How many handshakes would there be, if there were 6 people?"

Ask students: *Does this data look linear? What is the shape of this graph?*

The equation that matches the data is $y = 0.5(x^2 + x)$.