Chirp, Jump, Scatter

ID: 11515

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.

Topic: Function & Relation

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

Teacher Preparation and Notes

- *The student worksheet provides instructions and questions to guide inquiry and focus observations.*
- *When on a question page, students can press* ctrl ▲ *or* ***MENU > Check Question*** *to self-check their answer. Before using in another class, either have students not save changes or have them press* ***MENU > Clear Answers > Document*** *on a question application.*
- *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 and solution TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter "11515" in the keyword search box.***

Associated Materials

- *ChirpJumpScatter_Student.doc*
- *ChirpJumpScatter.tns*
- *ChirpJumpScatter_Soln.tns*

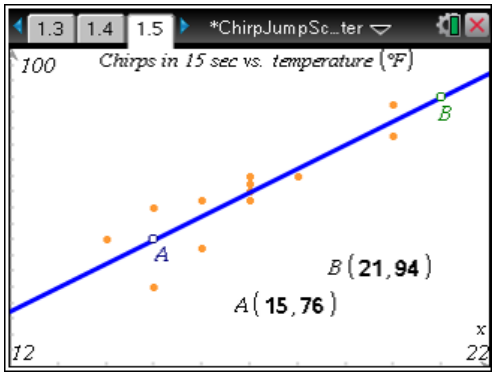
Suggested Related Activities

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*

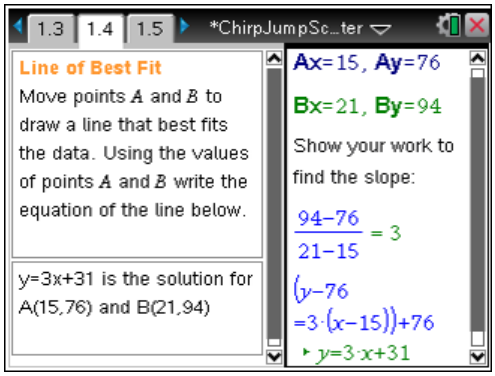
Problem 1 – Chirps in 15 Seconds vs. Temperature (°F)

Students are asked to look at temperature data (in °F) versus the number of cricket chirps in 15 seconds on page 1.3, then determine just by looking at the data whether there is a relationship between the two variables.



Because the data aren'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. However, from the graph, a trend is discernable.

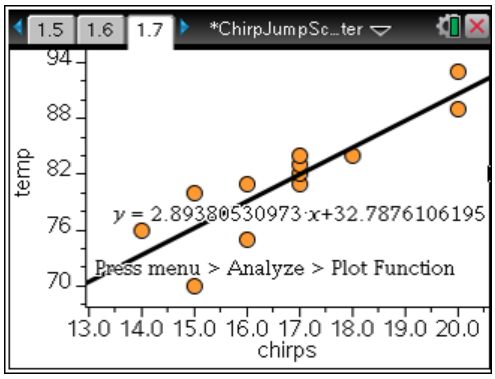
Students move points *A* and *B* on page 1.5 to approximate their line of best fit. They will record the points and use them to calculate the slope. The point-slope form or point-intercept form can be used to find the equation of the line.



Students will then use this equation to extrapolate their data and find the number of chirps when the temperature is 100 °F and 55 °F. They may need to manually adjust the split screen.

Possible Solution: With *A*(15, 76) and *B*(21, 94), $y = 3x + 31$ or $T = 3c + 31$ if *T* is temp in °F and *c* is the number of chirps in 15 seconds.

$100 = 3x + 31 \rightarrow x = 23$ chirps;
$55 = 3x + 31 \rightarrow x = 8$ chirps

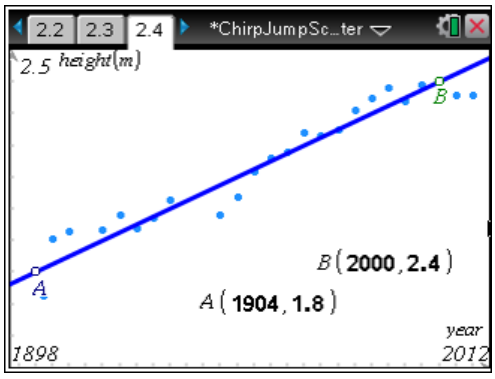


If students have difficulty with the concept of a line of best fit, or their drawn line on page 1.5 is a poor fit, page 1.7 can be easily used to graph a statistical linear regression. Press **MENU > Analyze > Regression > Show Linear (mx+b)**.

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

Problem 2 – Olympic High Jump

The process is repeated for the high jump. A trend of increasing height from the data is observable.



Possible Solution: With an equation of $y = 0.00625x - 10.1$, when $x = 2012$, $y = 2.475$ meters.

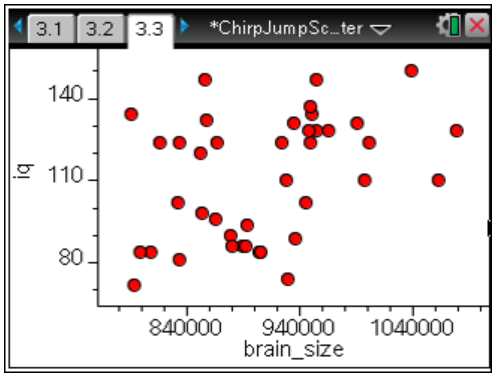
Column E on page 2.2 includes an average of the first half and second half of the data. The slope is also found in Column F. This can be used as another method of more analytically finding a best fit equation.

Problem 3 – Brain Size vs. IQ

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

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.

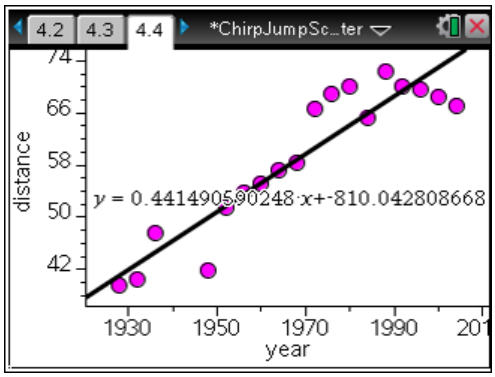


Extension/Homework

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

These examples show that not all data are 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 page 5.2 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?"

The answer and data are provided on page 5.3 where $n + 1$ is the number of people in the room and t is the number of handshakes.

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

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