Find That Sine

ID: 9734

Time required
45 minutes

Activity Overview

Students will sinusoidal regression to determine equations to model various data sets and use the equations to make inferences.

Topic: Trigonometric Functions

- *Calculate the trigonometric line of best fit to model bivariate data and use it to predict a value of one.*

Teacher Preparation and Notes

- *This investigation has students using sinusoidal regression with data sets and making inferences with the created equations.*
- *Students should already be familiar with the properties of sine graphs.*
- *This activity is intended to be teacher-led.*
- ***To download the student TI-Nspire document (.tns file) and student worksheet, go to education.ti.com/exchange and enter "9734" in the quick search box.***

Associated Materials

- *FindThatSine_Student.doc*
- *FindThatSine.tns*

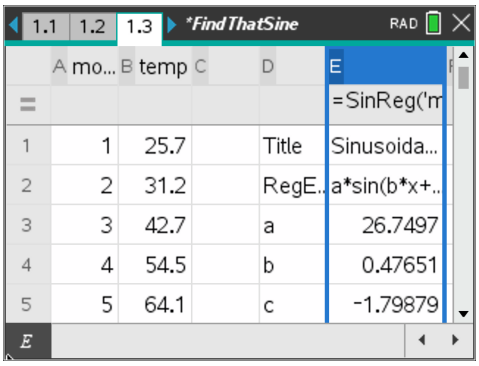
Suggested Related Activities

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

- *Changes in Latitude – Modeling a Sine Function (TI-Nspire technology) — 10145*
- *What's My Sine? (TI-Nspire technology) — 10091*
- *Vertical and Phase Shifts (TI-Nspire technology) — 8316*
- *The Sound of Music (TI-84 Plus and TI-Navigator) — 5549*

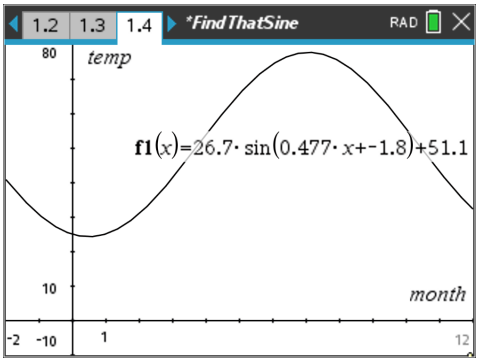
Problem 1 – Temperature

Students are to find the sinusoidal regression of the data found on page 1.3. Then, they need to create the scatter plot on page 1.4, selecting **month** for *x* and **temp** for *y*. Students can also graph the regression equation, which is stored in **f1**.



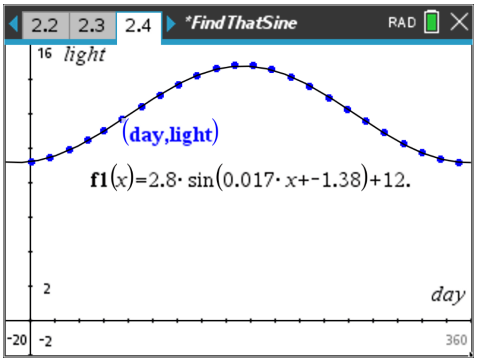
Some students may need more data points added to the spreadsheet to better see the periodic nature of the scatter plot. If this is done, change the months for the duplicate data to run from 13 to 24.

After students have determined and graphed the sine regression equation,
$f(x) = 26.75 \sin(0.47x - 1.80) + 51.1$, emphasize the need to check for its reasonableness of fit when compared to the scatter plot of the data.



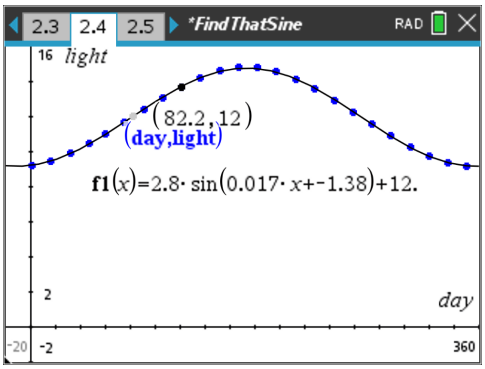
Problem 2 – Hours of Sunlight

Students are to find the sinusoidal regression of the data found on page 2.3. Then, they need to create the scatter plot on page 2.4, selecting **day** for *x* and **light** for *y*. Students can also graph the regression equation, which is stored in **f1**.



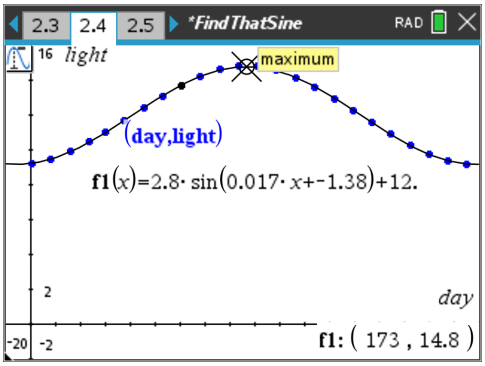
After the graph is cleaned-up and a point is created on the graph, the students will need to relocate the displayed coordinates, since it will move with the point otherwise. Also, to set the precision for two decimals, students can hover the cursor over the *x*-value and then press the minus key. Then repeat for the *y*-value.

The vernal equinox is on 81.64 calendar days or March 22. The autumnal equinox is on 264.97 calendar days or September 22.



To display the day for the summer and winter solstices, students will need to find the maximum and minimum points on the curve, respectively. Students may need to adjust the window.

The summer solstice is on 173.3 calendar days or June 22. The winter solstice is on 357.76 calendar days or December 22.

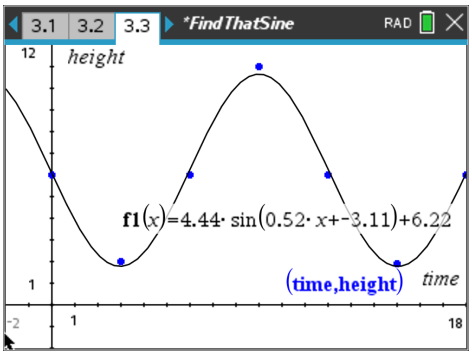


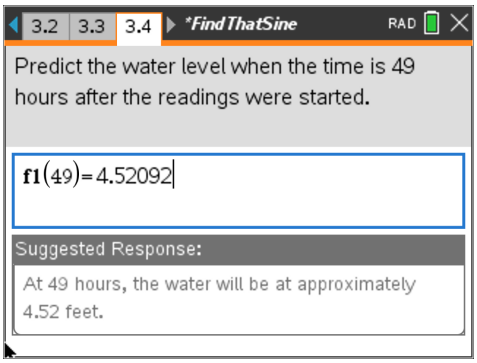
Problem 3 – Tides

Students are to find the sinusoidal regression of the data found on page 3.2. Then, they need to create the scatter plot on page 3.3, selecting **time** for *x* and **height** for *y*. Students can also graph the regression equation, which is stored in **f1**.

Students are asked to predict future events using the data. They can either trace the graph of the equation or they can calculate **f1**(49) using an expression box on page 3.4. At 49 hours, the water will be at approximately 4.52 feet.

Note: Students may ask how the handheld determines which **f1**(*x*) to use for the predicting. The handheld keeps all variables (*x*, *y*, **f1**(*x*), etc.) associated with a problem stored with only that problem. This means when the handheld encounters a new problem it stores all variable values with the past problem and resets the variables for the new problem.





Additional Practice Solution

$y = 150 \sin(0.52x - 2.09) + 650$