Quadratic Regression With Transformation Graphing – ID: 8206

Time required
30 minutes

Topic: Quadratic Functions & Equations

- *Represent a quadratic function as a table and as a graph.*
- *Observe the changes in the equation of a quadratic function under a translation and/or stretch.*

Activity Overview

In this activity, students create a scatter plot to show how the record time for the 200m World Records has changed over time. Next they will use the Transformation Graphing application to visually fit a simple quadratic function to the data. Then they use their approximations to make a prediction.

Teacher Preparation

This activity is designed to be used in an Algebra 2 or Algebra 1 classroom.

- *Prior to beginning this activity, students should have an introduction to quadratic equations and their graphs and some familiarity with the graphing calculator's lists.*

Classroom Management

- *This activity is intended to be mainly **student-centered**, with some periods of whole-class discussion. The .tns file helps guide students through the activity.*

TI-84 Plus Applications

Transformation Graphing

Quadratic Regression With Transformation Graphing

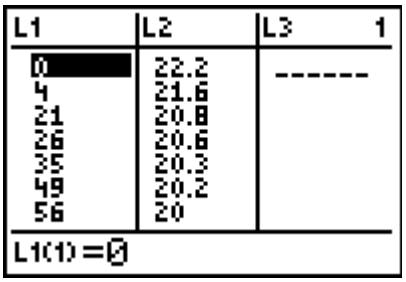
ID: 8206

In this activity we will

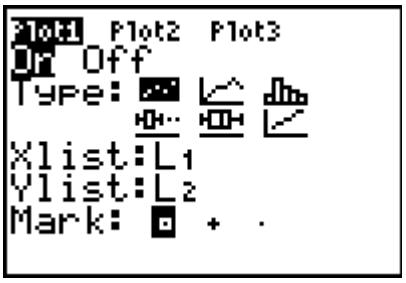
- *Enter data into lists and graph scatter plots.*
- *Perform a multiple regression on the plots.*
- *Make predictions or draw conclusions from the quadratic model.*

Name	Year	Time(s)
Walter Tewksbury (U.S.A.)	1900	22.2
Archie Hahn (U.S.A.)	1904	21.6
Charles Paddock (U.S.A.)	1921	20.8
Roland Locke (U.S.A.)	1926	20.6
Jesse Owens (U.S.A.)	1935	20.3
Melvin Patton (U.S.A.)	1949	20.2
David Sime (U.S.A.)	1956	20.0
Pietro Minnea (Italy)	1979	19.72
Michael Johnson (U.S.A.)	1996	19.32

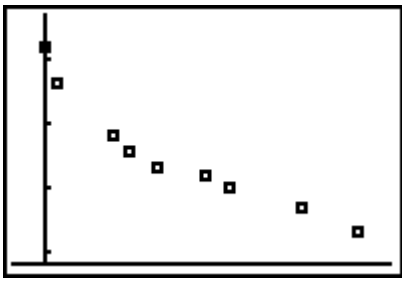
Enter the data for the 200m World Records into the lists in your calculator by pressing [STAT] then press [ENTER]. For the years, start at 0 and then enter the number of years since 1900 for each subsequent record (i.e. 1904 would be 4; 1921 would be 21; etc...).



Go to [STAT PLOT] and activate **Plot1**.

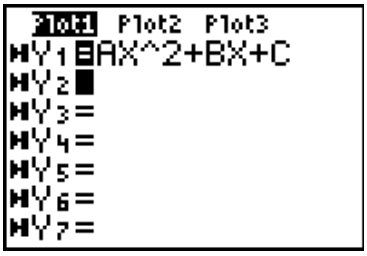


Select an appropriate viewing window and observe the graph of the data by pressing [GRAPH]. You may need to use **ZOOMSTAT** (press [ZOOM] then **9**) for better graphical representation.



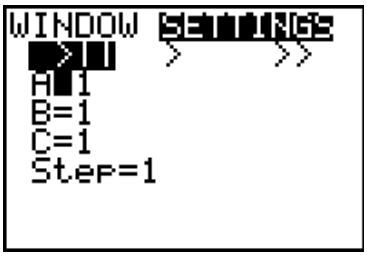
Press the **APPS** key and select the **Transfrm** application. Hit [ENTER]. You should see this screen.

Press any key. The transformation graphing is running in the background. Press [Y=] and enter the equation shown in $\mathbf{Y_1}$.

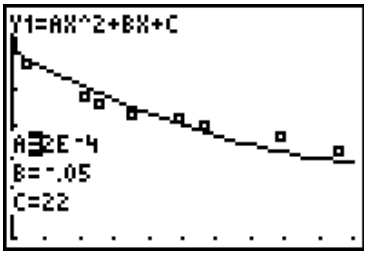


To change the value of one of the parameters, press [◄] or [►]. You can also type in the value. To move from parameter to another, press [▲] or [▼].

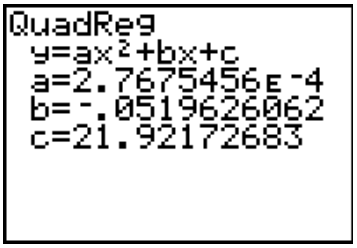
You can change the settings of the parameters (start values or step value) by pressing [WINDOW] and press [▲] to get the **SETTINGS** menu. Change the start values or step values to whatever you think.



Once you think you have fit a curve to the given data note the values of *a*, *b*, and *c*.



Perform a quadratic regression. Press [STAT], then [►] to get the **CALC** menu. Select **5:QuadReg**. The **QuadReg** command is pasted onto the home screen. Hit [ENTER].



You can graph the regression equation given by the calculator by entering the values generated by your calculator for *a*, *b*, and *c* from step 10.

The transformation graphing application doesn't allow you to graph two or more functions, so you must uninstall the application by pressing APPS and selecting the **Transfrm** application. Select **1:Uninstall**

Using your model and the regression model, what will the time be in 2004? in 2100? Return to your graph and press 2nd + TRACE. Select **1:Value**. Try entering $x = 104$ or $x = 200$ to see if the *y*-value could be plausible.