Algebra

Introduction to Regression

Finding a Regression Model

When analyzing data, we can use technology to find a function that closely approximates the collected values. This process of going from specific points to an equation is called **regression**. On the next page are the steps for using an online calculator at www.desmos.com/calculator , and then a TI-83 or TI-84 calculator to create a scatterplot and find a *regression equation* for a set of data.

Regression using Desmos.com

1. Make a table and enter data

2. Use the statistics approximation function ~ to type the general regression forms (don't forget the subscript "1" after the variables):
    Linear: $y_1 \sim mx_1 + b$
    Quadratic: $y_1 \sim ax_1^2 + bx_1 + c$

3. To extrapolate another value using this function, write the function with a number in place of x. If $x = 25$, type
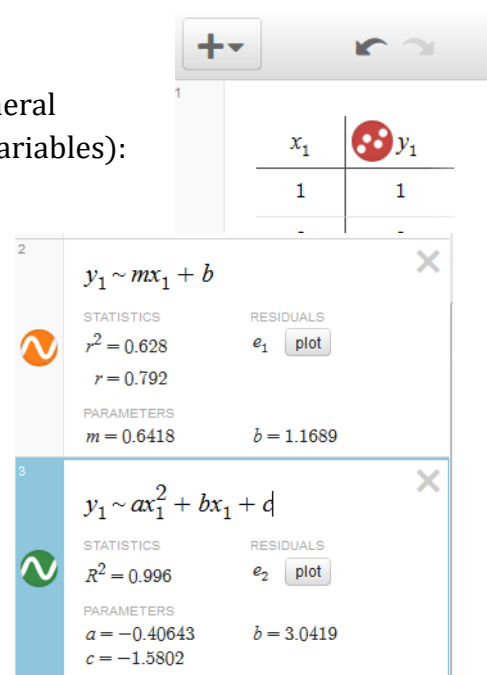   Linear: $m(25) + b$
    Quadratic: $a(25)^2 + b(25) + c$

    Then compute a specific value like $f(25)$

Try it out:

Below is some data that relates the temperature with the number.

a. Enter the data into Desmos and find a linear regression model:

b.   Use the Linear model to predict the temperature at 10 chirps/sec.

c. Find a Quadratic regression model ($ax_1^2 + bx_1 + c$)

d. Use this model to predict the temperature at 10 chirps/sec.

Chirps/Sec	Temperature
20	88.6
16	71.6
19.8	93.3
18.4	84.3
17.1	80.6
15.5	75.2
14.7	69.7
17.1	82
15.4	69.4
16.2	83.3

Steps for finding a regression equation with a TI Calculator:

Enter Data:

1. Go to [STAT] and select [1] to go to EDIT.
2. Enter the x-values into L_1 and enter the y-values into L_2.

Creating a scatterplot:

3. Now we need to graph these values in a scatterplot with the following steps.
4. Press [2nd] [Y=] to get the STAT PLOT menu.
5. Choose option [1] to get Plot 1
6. Select [On] to turn the plot on.
7. Choose the scatterplot option.
8. Since we used the lists L_1 and L_2., we do not need to change the Xlist or Ylist. If we did use a different list, we would need to change these.
9. To view the graph, hit the [ZOOM] button and choose ZoomStat which is option 9.

Finding a regression equation:

10. Now if we want find a linear regression, press [STAT] and choose CALC.
11. Choose the type of regression you want. For now, we will use LinReg and QuadReg for linear and quadratic regression.
12. This will send you back to the homescreen. You now just need to hit enter to get your equation.
13. (optional) If you want to store the equation in the equation editor, do this before pressing enter: Type a left-parenthesis, go to [Vars]→[Y-Vars] and select [Y1], type a right – parenthesis, then hit enter. Hit the [Y=] button to see your equation stored.

Example A rocket was shot in the air and the height measured at several times.

a) Use the data to calculate a quadratic regression equation for the height h, in feet, as a function of time t, in seconds.

Time (sec)	0	1	2	3
Height (ft)	0	460	925	1300

b) Use the function to approximate the maximum height of the rocket.

c) Use the function to approximate when the rocket will hit the ground.