



Graphing Calculator Investigation

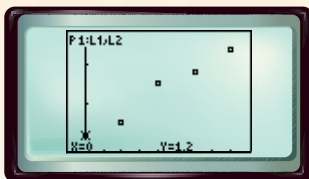
A Follow-Up of Lesson 13-3

Sharp EL-9900

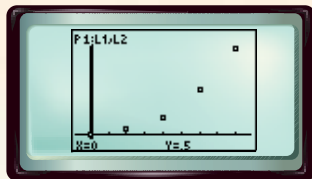
Curve Fitting

If there is a constant increase or decrease in data values, there is a linear trend. If the values are increasing or decreasing more and more rapidly, there may be a quadratic or exponential trend. The curvature of a quadratic trend tends to appear more gradual. Below are three scatter plots, each showing a different trend.

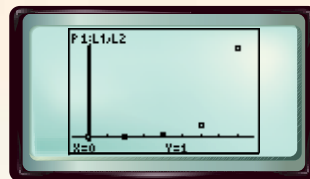
Linear Trend



Quadratic Trend



Exponential Trend



With a Sharp EL-9900, you can use the LinReg, QuadReg, and ExpReg functions to find the appropriate regression equation that best fits the data.

FARMING A study is conducted in which groups of 25 corn plants are given a different amount of fertilizer and the gain in height after a certain time is recorded. The table below shows the results.

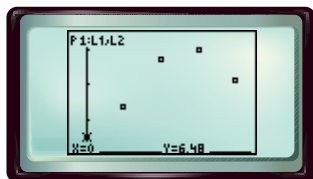
Fertilizer (mg)	0	20	40	60	80
Gain in Height (in.)	6.48	7.35	8.73	9.00	8.13

Step 1 Make a scatter plot.

- Enter the fertilizer in L1 and the height in L2.
KEYSTROKES: Review entering a list on page 204.

- Use STAT PLOT to graph the scatter plot.

KEYSTROKES: Review statistical plots on page 204.
Use **ZOOM** 9 to graph.



[-8, 88] scl: 5 by [6.0516, 9.4284] scl: 1

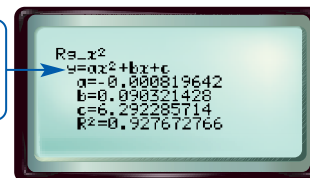
The graph appears to be a quadratic regression.

Step 2 Find the quadratic regression equation.

- Select Rg_{x^2} on the STAT REG menu.

KEYSTROKES: **STAT** **ALPHA** [D] 04 **ENTER**

The equation is in the form $y = ax^2 + bx + c$.



The equation is about $y = -0.0008x^2 + 0.1x + 6.3$.

R^2 is the **coefficient of determination**. The closer R^2 is to 1, the better the model. To choose a quadratic or exponential model, fit both and use the one with the R^2 value closer to 1.

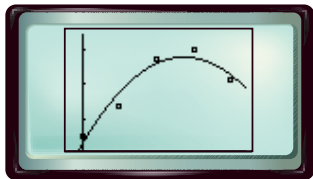


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Step 3 Graph the quadratic regression equation.

- Copy the equation to the Y= list and graph.

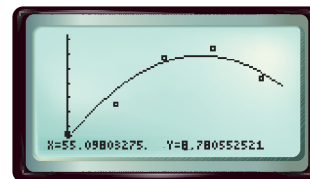
KEYSTROKES: $Y=$ 2^{nd} F [VARS] ALPHA [H]
 ENTER 1 ZOOM 9



Step 4 Predict using the equation.

- Find the amount of fertilizer that produces the maximum gain in height.

On average, about 55 milligrams of the fertilizer produces the maximum gain.



Exercises 1. exponential; 0.9969724389 2. linear; 0.389164209
 3. linear; 0.9974802029 4. quadratic; 0.97716799

See margin for graphs.

Plot each set of data points. Determine whether to use a *linear*, *quadratic*, or *exponential* regression equation. State the coefficient of determination.

1.

x	y
0.0	2.98
0.2	1.46
0.4	0.90
0.6	0.51
0.8	0.25
1.0	0.13

2.

x	y
1	25.9
2	22.2
3	20.0
4	19.3
5	18.2
6	15.9

3.

x	y
10	35
20	50
30	70
40	88
50	101
60	120

4.

x	y
1	3.67
3	5.33
5	6.33
7	5.67
9	4.33
11	2.67

TECHNOLOGY The cost of cellular phone use is expected to decrease. For Exercises 5–9, use the graph at the right.

- Make a scatter plot of the data. **See margin.**
- Find an appropriate regression equation, and state the coefficient of determination.
- Use the regression equation to predict the expected cost in 2004. **about 20.5¢**
- Do you believe that your regression equation is appropriate for a year beyond the range of data, such as 2020? Explain. **No; see margin.**
- What model may be more appropriate for predicting cost beyond 2003? **a linear model**

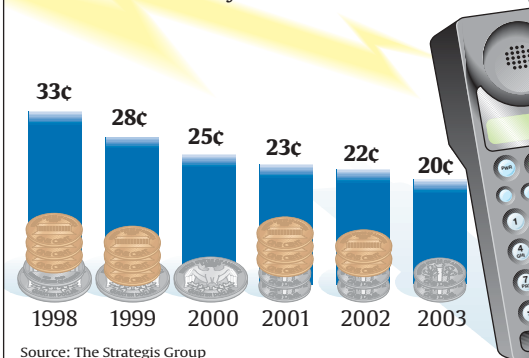
6. $y = 0.4107142857x^2 - 1645.696429x + 1,648,561$; 0.9880773362



USA TODAY Snapshots®

Cheaper wireless talk

Cheaper digital networks and more competition are expected to cut the cost of wireless phone use. Per-minute average in 1998 and projected cost in the next five years:



Source: The Strategis Group

By Anne R. Carey and Marcy E. Mullins, USA TODAY