

Activity 11

Best-Fit Line

TEACHER NOTES

Topic Area: Data Analysis and Probability

NCTM Standard: Select and use appropriate statistical methods to analyze data.

Objective: The student will be able to utilize the Casio fx-9750G Plus calculator to determine the best-fit line or line of regression of bivariate data in the various activities included in this unit.

Introduction: This activity is designed to help students to relate their knowledge of slope-intercept to constructing a line of best-fit. Using the line of best-fit, students will be required to make predictions. This topic of best-fit line is a common topic for state testing especially for open-ended tasks or multi-step written questions.

Students should be familiar with the following vocabulary.

Best-Fit Line

Bivariate Data

Line of Regression

Slope

Slope-Intercept Form

Y-Intercept

Calculator Notes for Activity 11

Objective: The student will be able to utilize the Casio fx-9750G Plus calculator to determine the best-fit line or line of regression of bivariate data in the various activities included in this unit.

Steps for Constructing a Line of Best-Fit

Problem: The following is a table displaying the death rates in California from 1970 to 2003. You are to construct a scatter plot on the calculator, draw the best-fit line, determine the equation of best-fit, and then predict what the death rate will be in the year 2050.

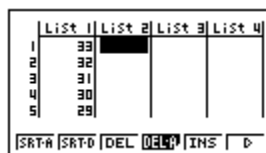
Year	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987
Death Rate	6.7	6.6	6.7	6.6	6.7	6.8	6.8	6.8	6.9	6.9	6.9	6.8	6.9	7	7.4	7.6	7.6
Year	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1776	1775	1974	1973	1972	1971	1970
Death Rate	7.5	7.6	7.6	7.4	7.6	7.6	7.8	7.6	7.7	7.6	7.8	7.9	8.1	8.3	8.3	8.3	8.3

Steps to Solve Best-Fit Problem

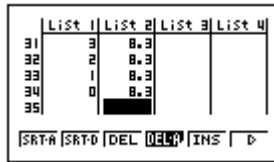
1. First you must enter the data into the calculator. To make it easy, let 1970 = 0; 1971 = 1; 1972 = 2, ... 2003 = 33. Turn the calculator on, use the arrow keys to choose the **STAT Menu** and press **EXE**. IF there is data in the calculator, delete it by pressing F6, then press F4 and then press F1 for each list that contains data. Fill the years into List 1 by pressing 33, **EXE**, 32, **EXE**, 31, **EXE**, and so on until you get to 0, **EXE**. Your screen should look like this.



Press the right arrow to move the cursor to List 2.



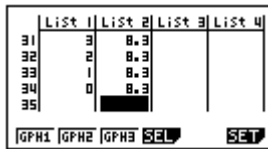
Enter the death rates into list 2 by pressing 6.7, EXE, 6.6, EXE, 6.7, EXE, and so on until all the data is entered.



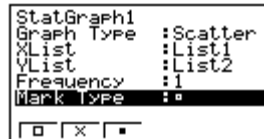
2. Once the data is entered, you need to tell the calculator to make the scatter plot of the points. Press F6 to get back to the following choices at the bottom of the screen.



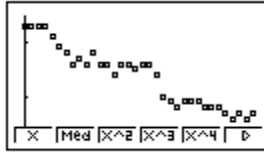
Choose F1 (GRPH).



Choose F6 (SET). In Graph Type, choose F1 (Scat), for XList choose F1 (List1), for YList choose F2 (List2), for Frequency choose F1 (1), and for Mark Type choose whatever you want but F1 is the easiest to view. Your screen of choices should look like this:



To draw the graph, press EXIT, then press F1 (GPH1). Your graph should look like the following.



This graph is called your scatter plot.

3. To draw your best-fit line on the scatter plot, you need to find the equation of best-fit first. To do this press F1 (x). This is your best-fit line selection. You should see this screen.

```

LinearRes
a =-0.0533078
b =8.25310924
r =-0.9621233
r^2=0.92568129
y=ax+b
                                [COPY] [DRAW]

```

Copy these numbers down because they are used to find the equation of best-fit. The a is the slope of the line, b is the y-intercept, r is the correlation coefficient which you will not need at this time, the r^2 will not be needed either. Under these letters, you will find the equation:

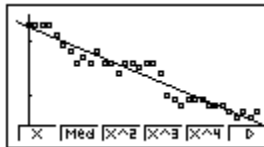
$$y = ax + b$$

You should recognize this as slope-intercept form which means that you substitute the a and b values into the equation to get:

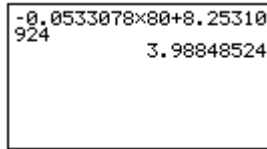
$$y = -0.0533078x + 8.25310924$$

This is your equation of best-fit.

4. To draw this equation of the best-fit line, or the regression line on the graph, press F6 (DRAW). Your screen should look like this.



5. Your last step is to predict what the death rate in California will be in 2050. If the year 1970 is 0, then to find what 2050 is subtract 1970 from 2050. Therefore, the $x = 80$. Substitute 80 for x into the equation of best-fit. On the calculator, press Menu, use the arrow keys to the RUN Menu, press (-), then press 0.0533078, press \times (multiplication sign), press 80 instead of the (x, θ, T) key, press +, and then press 8.25310924, EXE.



This means that in the year 2050, the death rate will be 3.99%.

Name _____ Class _____ Date _____

Activity 11: Worksheet Best-Fit Line

1. Using the data in the following table, you are to construct a scatter plot on the calculator, draw the best-fit line, determine the equation of best-fit, and then predict what y will be when x is 38.

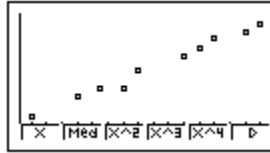
x	4	7	8.5	10	11	14	15	16	18	19
y	150	450	600	600	900	1100	1250	1400	1500	1650

2. Using the data in the following table, you are to construct a scatter plot on the calculator, draw the best-fit line, determine the equation of best-fit, and then predict what y will be when x is 1000.

x	50	75	80	100	150	175	210	250	260	320
y	0.35	0.5	0.6	0.7	0.75	0.85	1.05	0.9	1.05	1.15

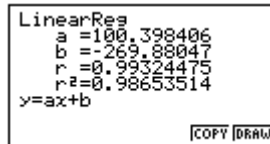
Solutions to Activity 11 Worksheet

1. The scatter plot should look like this:

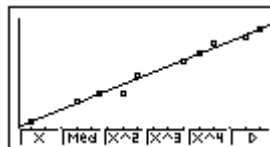


The equation of best-fit is:

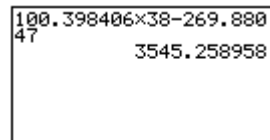
$$y = 100.398406 x - 269.88047$$



Drawing the best-fit line should look like this:



To make the prediction:



When x is 38, y will be 3545.258958.

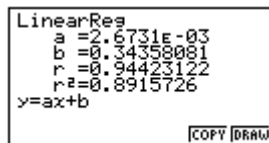
2. The scatter plot should look like this:



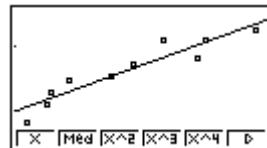
The equation of best-fit is:

$$y = .0026731 x + 0.34358081$$

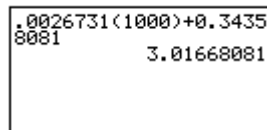
(2.6731E-03 means 2.6731×10^{-3} or .0026731)



Drawing the best-fit line should look like this:



To make the prediction:



When x is 1000, y will be 3.01668081.

