

Activity 10

Regression Lines

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-9860G Plus to utilize bivariate measurement data to determine regression equations, regression coefficients, and correlation coefficients.

Introduction: This activity is designed to demonstrate the procedure to enter data into the Casio fx-9860G Plus graphing calculator in order to calculate regression equations. Students will also be able to make predictions from their equation and scatter plots.

The students should be familiar with the following vocabulary.

Best-fit line

Bivariate data

Curvilinear data

Goodness of fit

Linearizing the data

Pearson product-moment correlation

Prediction equation

Regression line

Scatter plot

Calculator Notes for Activity 10

Objective: The student will be able to utilize the Casio fx-9860G Plus to utilize bivariate measurement data to determine regression equations, regression coefficients, and correlation coefficients.

Steps for Determining Regression Equations

Problem: Use the fx-9860G Plus graphing calculator to construct a scatter plot of the following data including the regression line, determine the regression equation and the Pearson product-moment correlation, and make a prediction for y if x is 150.

| | | | | | | | | | | |
|----------|---|---|---|---|---|---|---|---|---|----|
| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Y | 2 | 3 | 3 | 5 | 5 | 7 | 6 | 6 | 8 | 8 |

The first step is to enter this data into the calculator. To do this, turn the calculator on and go to the Stat menu (use the following key strokes).

Op\$|

Your screen should look like the following screen:

| | List 1 | List 2 | List 3 | List 4 |
|-----|--------|--------|--------|--------|
| SUB | | | | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |

GRAPH CALC TEST DNTB DIST ▶

If your screen has numbers in the lists, you will need to delete them. To do this press the following keys to get the previous screen.

urq

Enter the x-values into list 1 and the y-values into list 2. Use these key strokes to get the following screen.

1|2|3|4|5|6|7|8|9|10| $\$$ 2|3|3|5|5|7|6|6|8|8|

| | List 1 | List 2 | List 3 | List 4 |
|-----|--------|--------|--------|--------|
| SUB | | | | |
| 8 | 8 | 6 | | |
| 9 | 9 | 8 | | |
| 10 | 10 | 8 | | |
| 11 | | | | |

GRAPH CALC TEST DNTB DIST ▶

Next label list 1, x, and list 2, y. Use these key strokes to get the following screen.

N!Na+!\$\$Ba-l

| | List 1 | List 2 | List 3 | List 4 |
|-----|--------|--------|--------|--------|
| SUB | X | Y | | |
| 1 | 1 | 2 | | |
| 2 | 2 | 3 | | |
| 3 | 3 | 3 | | |
| 4 | 4 | 5 | | |

2

GRAPH CALC TEST INTR DIST

Now you are ready to construct the graph. At the bottom of the screen, go to GRAPH, and then Set to choose the graph type using the following key strokes.

qu

Your screen should look like this:

| | |
|-------------------|--------|
| StatGraph1 | |
| Graph Type | :Hist |
| XList | :List1 |
| Frequency | :1 |
| GP1 GP2 GP3 | |

Move your cursor to Graph Type. Notice that you have a number of choices; Histogram, Box, Normal Distribution, Broken-Line, Scatter Plot, etc. Choose Scat for scatter plot. The XLIST should be set to list 1, YLIST should be set to list 2, Freq leave at 1, and mark type set as the dark box. Use these key strokes to get the following screen.

NqNq1INq2INNeI

| | List 1 | List 2 | List 3 | List 4 |
|-----|--------|--------|--------|--------|
| SUB | X | Y | | |
| 1 | 1 | 2 | | |
| 2 | 2 | 3 | | |
| 3 | 3 | 3 | | |
| 4 | 4 | 5 | | |
| | | | | 1 |
| | GP1 | GP2 | GP3 | SEL |
| | | | | SET |

Go to SEL to turn graph 1 on. Use these key strokes to get the following screen.

rqu



At the bottom of the screen, go to Calc and X. Use these key strokes to get to the following screen.

qw

```
LinearReg
  a =0.66060606
  b =1.66666666
  r =0.94753953
  r²=0.89783117
  MSe=0.51212121
y=ax+b
          [COPY] [DRAW]
```

Slope of the regression line = a = .66060606

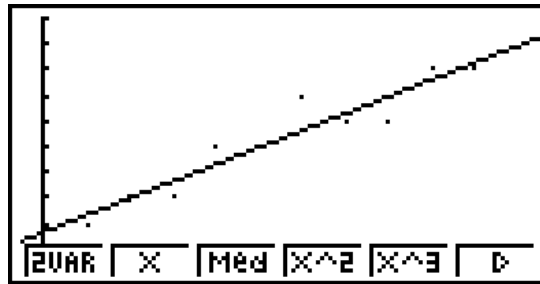
Y-intercept of the regression line = b = 1.6666666

Pearson product-moment correlation = r = .94753953

Therefore, the regression equation is:

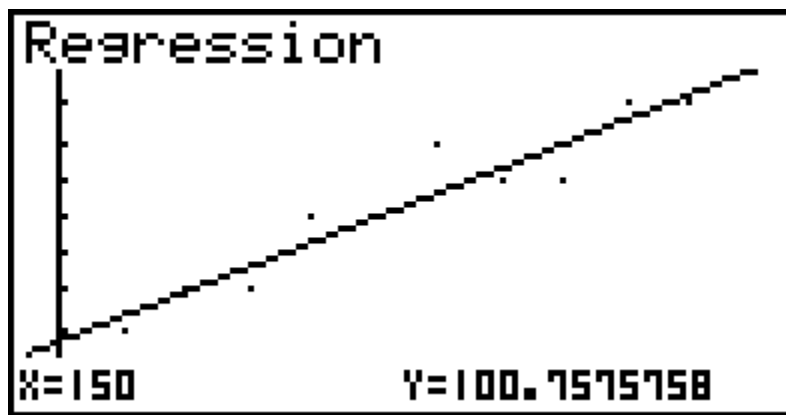
$$y = .66060606x + 1.66666666$$

Since the r is positive, it means the slope of the line is positive. Since the r is very close to +1, the points are very close to the regression line. To graph the regression line, use this key stroke (u) to get the following screen.



To make the prediction, use the G-solve capabilities of this calculator. Use the following key strokes to find the y value when x is 150.

Lyql150l



Therefore, when $x = 150$, y will be 100.7575758 or 101.

Name _____ Class _____ Date _____

Activity 10: Worksheet Regression Equations

1. Use the fx-9860G Plus graphing calculator to construct a scatter plot of the following data including the regression line; determine the regression equation and the Pearson product-moment correlation, and make a prediction for y if x is 48.

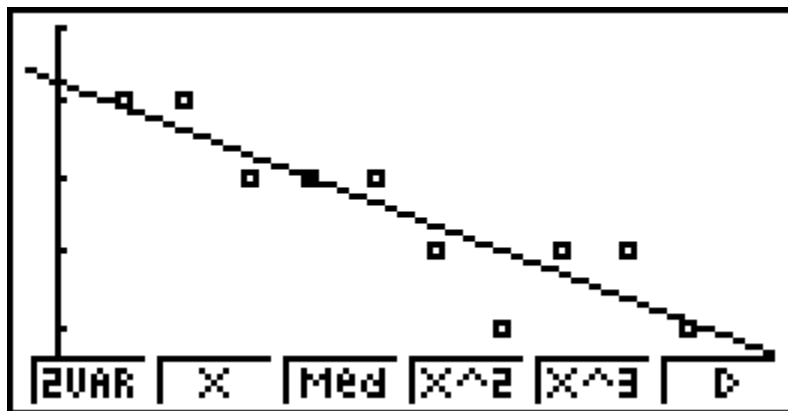
| | | | | | | | | | | |
|----------|----|----|---|---|---|---|---|---|---|----|
| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Y | 10 | 10 | 9 | 9 | 9 | 8 | 7 | 8 | 8 | 7 |

2. Use the fx-9860G Plus graphing calculator to construct a scatter plot of the following data including the regression line; determine the regression equation and the Pearson product-moment correlation, and make a prediction for y if x is 86.

| | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|-----|
| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Y | 42 | 46 | 57 | 62 | 64 | 78 | 83 | 94 | 92 | 107 |

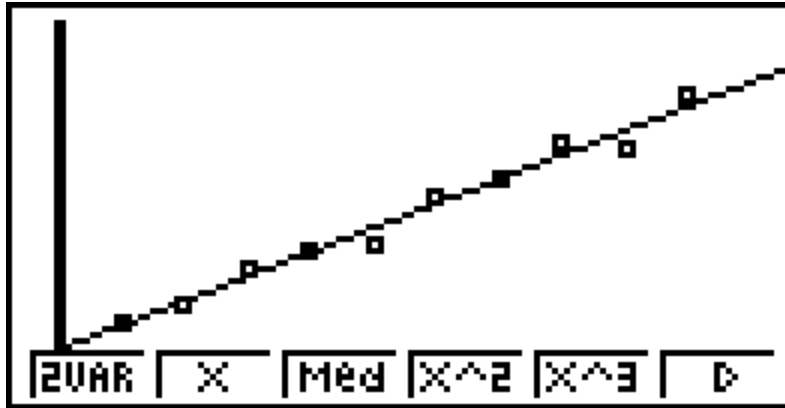
Solutions to Activity 10 Worksheet

1.



Regression equation: $y = -.3212121x + 10.2666666$
 Pearson product-moment correlation = $r = -.9003767$
 If $x = 48$, then $y = -5.151515152$

2.



Regression equation: $y = 7.08484848x + 33.5333333$

Pearson product-moment correlation = $r = .98961068$

If $x = 86$, then $y = 642.830303$