



# Graphing Calculator

A Follow-Up of Lesson 5-7

Casio Algebra FX 2.0

## Regression and Median-Fit Lines

One type of equation of best-fit you can find is a linear **regression equation**.

**EARNINGS** The table shows the average hourly earnings of U.S. production workers for selected years.

| Year     | 1960   | 1965 | 1970 | 1975 | 1980 | 1985 | 1990  | 1995  | 1999  |
|----------|--------|------|------|------|------|------|-------|-------|-------|
| Earnings | \$2.09 | 2.46 | 3.23 | 4.53 | 6.66 | 8.57 | 10.01 | 11.43 | 13.24 |

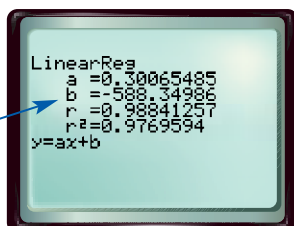
Source: Bureau of Labor Statistics

Find and graph a linear regression equation. Then predict the average hourly earnings in 2010.

### Step 1 Find a regression equation.

- Enter the years in L1 and the earnings in L2.  
**KEYSTROKES:** Review entering a list on page 204.
- Find the regression equation on the STAT menu.  
**KEYSTROKES:**  $\boxed{\text{MENU}}$  2  $\boxed{\text{F2}}$  3 1

The equation is in the form  $y = ax + b$ .

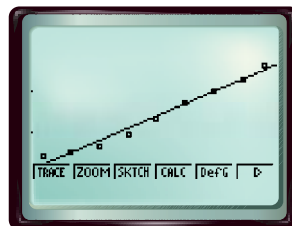


The equation is about  $y = 0.30x - 588.35$ .

$r$  is the **linear correlation coefficient**. The closer the absolute value of  $r$  is to 1, the better the equation models the data. Because the  $r$  value is close to 1, the model fits the data well.

### Step 2 Graph the regression equation.

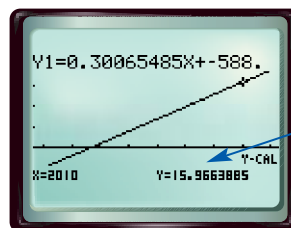
- Graph the scatter plot.  
**KEYSTROKES:**  $\boxed{\text{SHIFT}}$   $\boxed{[\text{QUIT}]}$   $\boxed{\text{F1}}$  1
- Graph the linear regression equation.  
**KEYSTROKES:**  $\boxed{\text{F4}}$  2  $\boxed{\text{F5}}$   $\boxed{\text{EXE}}$   $\boxed{\text{F6}}$



### Step 3 Predict using the regression equation.

- Find  $y$  when  $x = 2010$  using value on the CALC menu.  
**KEYSTROKES:**  $\boxed{\text{MENU}}$  3  $\boxed{\text{F1}}$   $\boxed{\text{F5}}$   $\boxed{\text{F2}}$  4  $\boxed{\text{EXE}}$   
 $\boxed{\text{F4}}$  6 2010  $\boxed{\text{EXE}}$

According to the regression equation, the average hourly earnings in 2010 will be about \$15.97.



The graph and the coordinates of the point are shown.

[www.algebra1.com/other\\_calculator\\_keystrokes](http://www.algebra1.com/other_calculator_keystrokes)

# Investigation

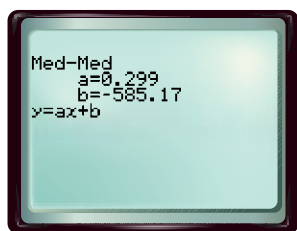
A second type of best-fit line that can be found using a graphing calculator is a **median-fit line**. The equation of a median-fit line is calculated using the medians of the coordinates of the data points.

Find and graph a median-fit equation for the data on hourly earnings. Then predict the average hourly earnings in 2010. Compare this prediction to the one made using the regression equation.

## Step 1 Find a median-fit equation.

- The data are already in Lists 1 and 2. Find the median-fit equation by using Med-Med on the STAT menu.

KEYSTROKES: **MENU** 2 **F2** 3 2

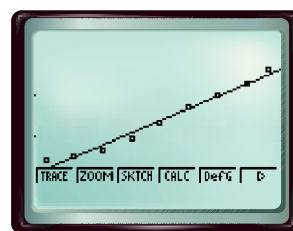


The median-fit equation is  $y = 0.299x - 585.17$ .

## Step 2 Graph the median-fit equation.

- Return to the stat menu and graph the equation.

KEYSTROKES: **ESC** **F1** 1 **F4** 3 **F5**  
**EXE** **F6**

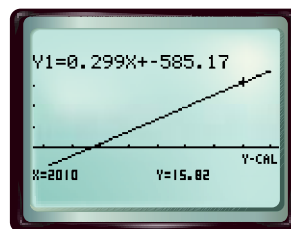


[1950, 2010] scl: 10 by [0, 20] scl: 5

## Step 3 Predict using the median-fit equation.

KEYSTROKES: **MENU** 3 **F1** **F5** **F2** 4 **EXE** **F4**  
6 2010 **EXE**

According to the median-fit equation, the average hourly earnings in 2010 will be about \$15.82. This is slightly less than the predicted value found using the regression equation.



## Exercises

Refer to the data on bald eagles in Example 2 on pages 300 and 301.

- Find regression and median-fit equations for the data. **1–5. See margin.**
- What is the correlation coefficient of the regression equation? What does it tell you about the data?
- Use the regression and median-fit equations to predict the number of bald eagle pairs in 1998. Compare these to the number found in Example 3 on page 301.

For Exercises 4 and 5, use the table that shows the number of votes cast for the Democratic presidential candidate in selected North Carolina counties in the 1996 and 2000 elections.

- Find regression and median-fit equations for the data.
- In 1996, New Hanover County had 22,839 votes for the Democratic candidate. Use the regression and median-fit equations to estimate the number of votes for the Democratic candidate in that county in 2000. How do the predictions compare to the actual number of 29,292?

| 1996    | 2000    |
|---------|---------|
| 14,447  | 16,284  |
| 19,458  | 19,281  |
| 28,674  | 30,921  |
| 31,658  | 38,545  |
| 32,739  | 38,626  |
| 46,543  | 52,457  |
| 49,186  | 53,907  |
| 69,208  | 80,787  |
| 103,429 | 126,911 |
| 103,574 | 123,466 |

Source: NC State Board of Elections