



# Graphing Calculator Investigation

A Follow-Up of Lesson 2-5

Casio CFX-9850GB Plus

## Lines of Regression

You can use a Casio CFX-9050GB Plus graphing calculator to find a line that best fits a set of data. This line is called a **regression line** or **line of best fit**. You can also use the calculator to draw scatter plots and make predictions.

**INCOME** The table shows the median income of U.S. families for the period 1970–1998.

| Year        | 1970 | 1980   | 1985   | 1990   | 1995   | 1998   |
|-------------|------|--------|--------|--------|--------|--------|
| Income (\$) | 9867 | 21,023 | 27,735 | 35,353 | 40,611 | 46,737 |

Source: U.S. Census Bureau

Find and graph a regression equation. Then predict the median income in 2010.

### Step 1 Find a regression equation.

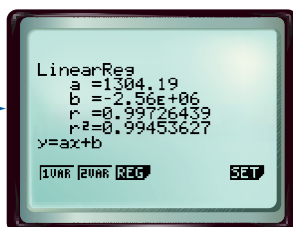
- Enter the years in L1 and the incomes in L2.

KEYSTROKES: **MENU** 2 1970 **EXE**

- Find the regression equation on the STAT menu.

KEYSTROKES: **F2** **F3** **F1**

The regression equation is about  $y = 1304.19x - 2,560,000$



The slope indicates that family incomes were increasing at a rate of about \$1300 per year.

The number  $r$  is called the **linear correlation coefficient**. The closer the value of  $r$  is to 1 or  $-1$ , the closer the data points are to the line.

### Step 2 Graph the regression equation.

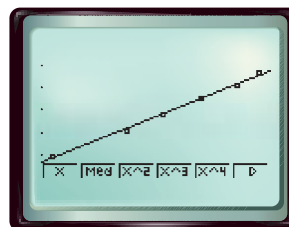
- Graph a scatter plot.

KEYSTROKES: **EXIT** **EXIT** **F1** **F4** **F1**  
**F6**

- Select the scatter plot, L1 as the Xlist, and L2 as the Ylist.

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

KEYSTROKES: **F1** **F5** **EXE** **F6**



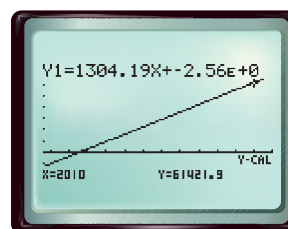
Notice that the regression line does not pass through all of the data points, but comes close to all of them. The line fits the data very well.

### Step 3 Predict using the regression equation.

- Find  $y$  when  $x = 2010$ . Use G-SLV on the GRAPH menu.

KEYSTROKES: **MENU** 5 **EXE** **SHIFT** **F2** **F4** **SHIFT**  
**F5** **F6** **F1** 2010 **EXE**

According to the regression equation, the median family income in 2010 will be about \$61,422.



## Graphing Calculator Investigation

### Exercises

**GOVERNMENT** For Exercises 1–3, use the table below that shows the population and the number of representatives in Congress for selected states.

| State                 | CA   | NY   | TX   | FL   | NC  | IN  | AL  |
|-----------------------|------|------|------|------|-----|-----|-----|
| Population (millions) | 29.8 | 18.0 | 17.0 | 12.9 | 6.6 | 5.5 | 4.0 |
| Representatives       | 52   | 31   | 30   | 23   | 12  | 10  | 7   |

Source: *The World Almanac*

1. Make a scatter plot of the data. **See margin.**
2. Find a regression equation for the data.  $y = 1.73x + 0.39$
3. Predict the number of representatives for Oregon, which has a population of about 2.8 million. **5**

**BASEBALL** For Exercises 4–6, use the table at the right that shows the total attendance for minor league baseball in some recent years.

4. Make a scatter plot of the data. **See margin.**
5. Find a regression equation for the data.  $y = 1.31x - 2581.6$
6. Predict the attendance in 2010. **51,500,000**

| Year | Attendance (millions) |
|------|-----------------------|
| 1985 | 18.4                  |
| 1990 | 25.2                  |
| 1995 | 33.1                  |
| 2000 | 37.6                  |

Source: National Association of Professional Baseball Leagues

**TRANSPORTATION** For Exercises 7–11, use the table below that shows the retail sales of motor vehicles in the United States for the period 1992–1999.

| Motor Vehicle Sales  |        |        |        |        |        |        |        |        |
|----------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| Year                 | 1992   | 1993   | 1994   | 1995   | 1996   | 1997   | 1998   | 1999   |
| Vehicles (thousands) | 13,118 | 14,199 | 15,413 | 15,118 | 15,456 | 15,498 | 15,963 | 17,414 |

Source: American Automobile Manufacturers Association

**9. about 470,000 vehicles more per year**

7. Make a scatter plot of the data. **See margin.**
8. Find a regression equation for the data.  $y = 470.06x - 922,731.40$
9. According to the regression equation, what was the average rate of change of vehicle sales during the period?
10. Predict the sales in 2010. **about 22,088,000**
11. How accurate do you think your prediction is? Explain. **See margin.**

**RECREATION** For Exercises 12–15, use the table at the right that shows the amount of money spent on skin diving and scuba equipment in some recent years. **14. about \$440,000,000**

12. Find a regression equation for the data.  $y = 6.93x - 13,494.43$
13. Delete the outlier (1997, 332) from the data set. Then find a new regression equation for the data.  $y = 7.36x - 14,354.33$
14. Use the new regression equation to predict the sales in 2010.
15. Compare the new correlation coefficient to the old value and state whether the regression line fits the data better. **See margin.**

| Skin Diving and Scuba Equipment |                     |
|---------------------------------|---------------------|
| Year                            | Sales (\$ millions) |
| 1993                            | 315                 |
| 1994                            | 322                 |
| 1995                            | 328                 |
| 1996                            | 340                 |
| 1997                            | 332                 |
| 1998                            | 345                 |
| 1999                            | 363                 |

Source: National Sporting Goods Association