



Graphing Calculator Investigation

A Follow-Up of Lesson 2-5

Sharp EL-9900

Lines of Regression

You can use a Sharp EL-9900 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.

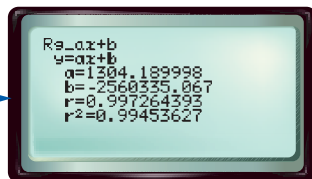
- Enter the years in L1 and the incomes in L2.

KEYSTROKES: **STAT** **ALPHA** **[A]** **ENTER**
1970 **ENTER**

- Find the regression equation by selecting Rg_{ax+b} on the STAT REG menu.

KEYSTROKES: **2nd** **CL** **STAT** **ALPHA** **[D]**
02 **ENTER**

The regression equation is about $y = 1304.19x - 2,560335.07$.



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.

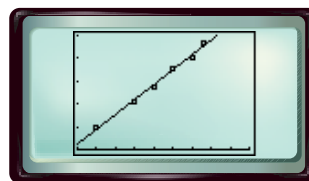
- Use STAT PLOT to graph a scatter plot.

KEYSTROKES: **STAT PLOT** **ALPHA** **[A]** **ENTER**
ENTER

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

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

KEYSTROKES: **Y=** **2nd** **F** **VARS** **ALPHA** **[H]**
ENTER **ALPHA** **[B]** 1 **GRAPH**



[1965, 2010] scl: 5 by [0, 50,000] scl: 10,000

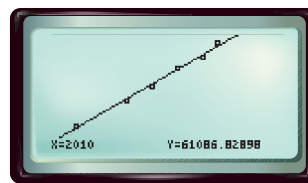
Notice that the regression line does not pass through any of the data points, but comes close to all of them. The line fits the data very well.

Step 3 Predict using the regression equation.

- Find y when $x = 2010$. Use value on the CALC menu.

KEYSTROKES: **2nd** **F** **CALC** 1 2010 **ENTER**

According to the regression equation, the median family income in 2010 will be about \$61,087.



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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