

9-2 Lines of Best Fit

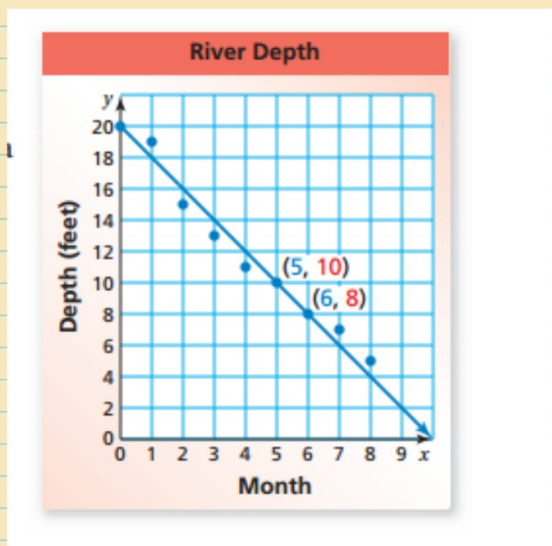
A **line of fit** is a line drawn on a scatter plot close to most of the data points. It can be used to estimate data on a graph.

1 Finding a Line of Fit

The table shows the depth of a river x months after a monsoon season ends. (a) Make a scatter plot of the data and draw a line of fit. (b) Write an equation of the line of fit. (c) Interpret the slope and the y -intercept of the line of fit. (d) Predict the depth in month 9.

Month, x	Depth (feet), y
0	20
1	19
2	15
3	13
4	11
5	10
6	8
7	7
8	5

- a. Plot the points in a coordinate plane. The scatter plot shows a negative linear relationship. Draw a line that is close to the data points. Try to have as many points above the line as below it.



- b. The line passes through (5, 10) and (6, 8).

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{-2}{1} = -2$$

Because the line crosses the y -axis at (0, 20), the y -intercept is 20.

∴ So, an equation of the line of fit is $y = -2x + 20$.

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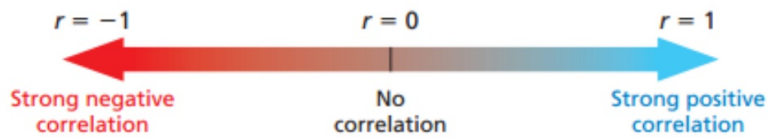
- c.** The slope is -2 , and the y -intercept is 20 . So, the depth of the river is 20 feet at the end of the monsoon season and decreases by about 2 feet per month.

- d.** To predict the depth in month 9 , substitute 9 for x in the equation of the line of fit.

$$y = -2x + 20 = -2(9) + 20 = 2$$

- ❖ The depth in month 9 should be about 2 feet.

Graphing calculators use a method called *linear regression* to find a precise line of fit called a **line of best fit**. This line best models a set of data. A calculator often gives a value r called the *correlation coefficient*. This value tells whether the correlation is positive or negative, and how closely the equation models the data. Values of r range from -1 to 1 . When r is close to 1 or -1 , there is a strong correlation between the variables. As r gets closer to 0 , the correlation becomes weaker.

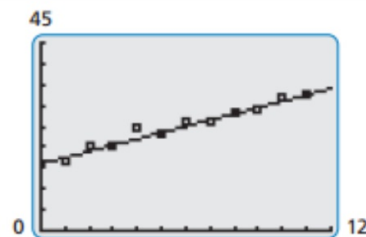


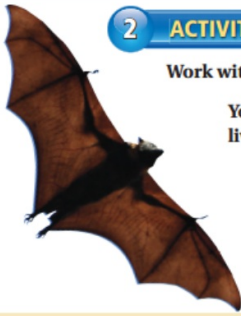
2 Finding a Line of Best Fit Using Technology

The table shows the worldwide movie ticket sales y (in billions of dollars) from 2000 to 2011, where $x = 0$ represents the year 2000. Use a graphing calculator to find an equation of the line of best fit. Identify and interpret the correlation coefficient.

Year, x	0	1	2	3	4	5	6	7	8	9	10	11
Ticket Sales, y	16	17	20	20	25	23	26	26	28	29	32	33

Check Use a graphing calculator to make a scatter plot and graph the line of best fit.





2 ACTIVITY: Representing Data by a Linear Equation

Work with a partner. You are a biologist and study bat populations.

You are asked to predict the number of bats that will be living in an abandoned mine after 3 years.

To start, you find the number of bats that have been living in the mine during the past 8 years.

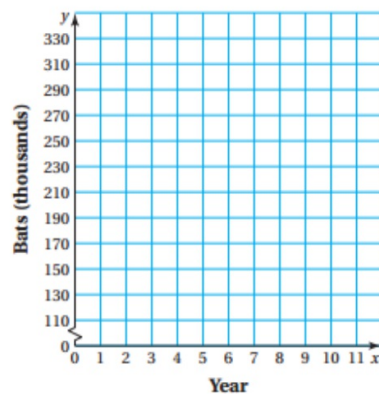
The table shows the results of your research.

Year, x	0	1	2	3	4	5	6	7
Bats (thousands), y	327	306	299	270	254	232	215	197

Annotations: "7 years ago" points to $x=0$; "this year" points to $x=7$.

Use the following steps to predict the number of bats that will be living in the mine after 3 years.

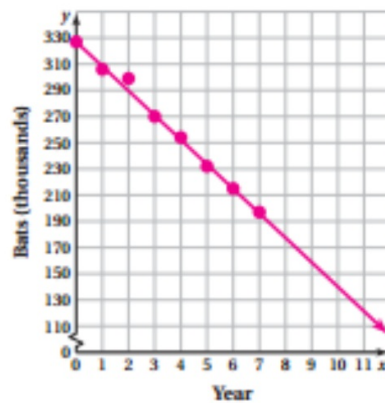
- Graph the data in the table.
- Draw a line that you think best approximates the points.
- Write an equation for your line.
- MODELING** Use the equation to predict the number of bats in 3 years.



Use the following steps to predict the number of bats that will be living in the mine after 3 years.

- Graph the data in the table.
- Draw a line that you think best approximates the points.
- Write an equation for your line.

Sample answer:
 $y = -18.7x + 327$



- MODELING** Use the equation to predict the number of bats in 3 years.

Sample answer: 140 thousand bats

Mini-Assessment

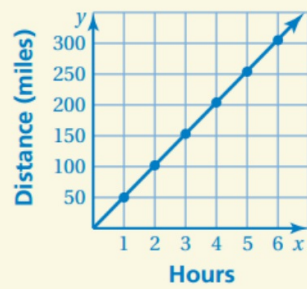
- The table shows the distance you travel over a 6-hour period.

Hours, x	Distance (miles), y
1	50
2	102
3	153
4	204
5	254
6	305

- Make a scatter plot of the data, draw a line of fit, and write its equation.

- Interpret the slope of the line of fit.

- a.** Make a scatter plot of the data, draw a line of fit, and write its equation.



$$y = 51x$$

- b.** Interpret the slope of the line of fit.
You travel about 51 miles each hour.