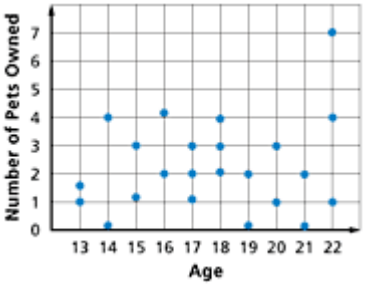
Lesson 5-7

Example 1 Analyze Scatter Plots

Determine whether each graph shows a *positive* correlation, a *negative* correlation, or *no* correlation. If there is a positive or negative correlation, describe its meaning in the situation.

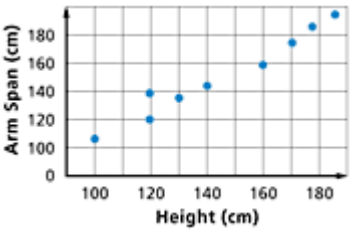
a. The graph shows the age of 20 people and the number of pets owned.

The graph shows no correlation.



b. The graph shows the height and arm span for a group of 10 people.

The graph shows a positive correlation. As the height increases, the arm span increases.



Example 2 Find a Line of Fit

The table shows the percent of U.S. workers in Farm Occupations.

Years since 1900	0	20	40	60	80	94
Farm Workers	37.5	27	17.4	6.1	2.7	2.5

Source: *The World Almanac*

a. Draw a scatter plot and determine what relationship exists, if any, in the data.

Let the independent variable x be the number of years since 1900, and let the dependent variable y be the percent of U.S. workers in Farm Occupations. The scatter plot seems to indicate that as the number of years increases, the percent of U.S. workers decreases. There is a negative correlation between the two variables.

b. Draw a line of fit for the scatter plot.

No one line will pass through all of the data points. Draw a line that passes close to the points. A line of fit is shown in the scatter plot at the right.

c. Write the slope-intercept form of an equation for the line of fit.

The line of fit shown above passes through the data points (20, 27) and (94, 2.5).

Step 1: Find the slope.

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$ Slope formula

$m = \dfrac{27 - 2.5}{20 - 94}$ $(x_1, y_1) = (94, 2.5)$ and $(x_2, y_2) = (20, 27)$

$m = \dfrac{24.5}{-74}$ or $-\dfrac{49}{148}$ Simplify.

Step 2: Use $m = -\dfrac{49}{148}$ and either point-slope form or the slope-intercept form to write the equation.

You can use either data point. We chose (20, 27).

Point-slope form

$y - y_1 = m(x - x_1)$

$y - 27 = -\dfrac{49}{148}(x - 20)$

$y - 27 = -\dfrac{49}{148}x + \dfrac{245}{37}$

$y = -\dfrac{49}{148}x + \dfrac{1244}{37}$

Slope-intercept form

$y = mx + b$

$27 = -\dfrac{49}{148}(20) + b$

$27 = -\dfrac{245}{37} + b$

$\dfrac{1244}{37} = b$

Using either method, $y = -\dfrac{49}{148}x + \dfrac{1244}{37}$.

Check: Check your result by substituting (94, 2.5) into $y = -\frac{49}{148}x + \frac{1244}{37}$.

$y = -\frac{49}{148}x + \frac{1244}{37}$	Line of fit equation
$2.5 \stackrel{?}{=} -\frac{49}{148}(94) + \frac{1244}{37}$	Replace x with 94 and y with 2.5.
$2.5 \stackrel{?}{=} -\frac{2303}{74} + \frac{1244}{37}$	Multiply.
$2.5 = \frac{5}{2}$ or 2.5	Add.

The solution checks.

Example 3 Linear Interpolation

Use the equation for the line of fit in Example 2 to estimate the percent of U.S. workers in farm occupations in 1996.

Use the equation $y = -\frac{49}{148}x + \frac{1244}{37}$, where x is the number of years since 1900 and y is the percent of workers in farm occupations.

$y = -\frac{49}{148}x + \frac{1244}{37}$	Original equation
$y = -\frac{49}{148}(96) + \frac{1244}{37}$	Replace x with 1996 – 1900 or 96.
$y = \frac{68}{37}$ or about 1.84%	Simplify.

About 1.84% of all U.S. workers in 1996 worked in farm occupations.