

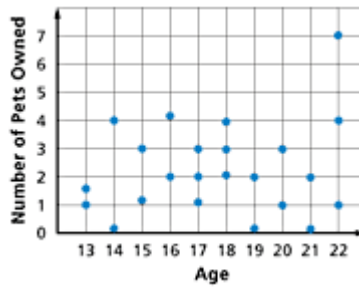
Lesson 5-7

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.

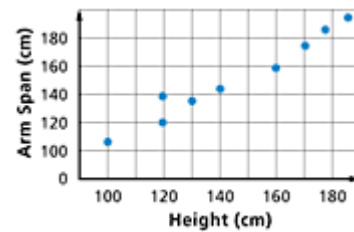
- a. The graph shows the age of 20 people and the number of pets owned.

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.

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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.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{Slope formula}$$

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

$$m = \frac{24.5}{-74} \text{ or } -\frac{49}{148} \quad \text{Simplify.}$$

Step 2: Use $m = -\frac{49}{148}$ 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

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

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

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

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

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

Slope-intercept form

$$y = mx + b$$

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

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

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

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

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

$$y = -\frac{49}{148}x + \frac{1244}{37} \quad \text{Line of fit equation}$$

$$2.5 = -\frac{49}{148}(94) + \frac{1244}{37} \quad \text{Replace } x \text{ with } 94 \text{ and } y \text{ with } 2.5.$$

$$2.5 = -\frac{2303}{74} + \frac{1244}{37} \quad \text{Multiply.}$$

$$2.5 = \frac{5}{2} \text{ or } 2.5 \quad \text{Add.}$$

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.

$$y = -\frac{49}{148}x + \frac{1244}{37} \quad \text{Original equation}$$

$$y = -\frac{49}{148}(96) + \frac{1244}{37} \quad \text{Replace } x \text{ with } 1996 - 1900 \text{ or } 96.$$

$$y = \frac{68}{37} \text{ or about } 1.84\% \quad \text{Simplify.}$$

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