1-6

Study Guide

Modeling Real-World Data with Linear Functions

When real-world data are collected, the data graphed usually do not form a straight line. However, the graph may approximate a linear relationship.

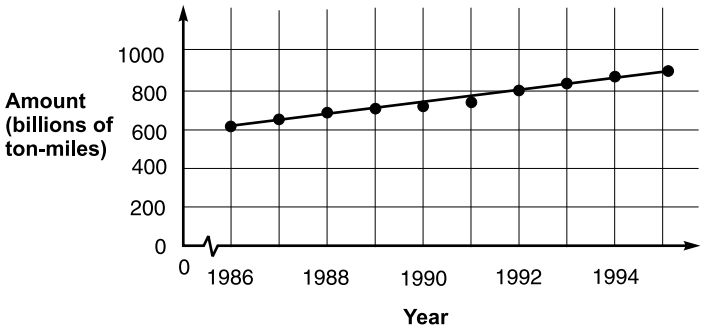
Example **The table shows the amount of freight hauled by trucks in the United States. Use the data to draw a line of best fit and to predict the amount of freight that will be carried by trucks in the year 2010.**

U.S. Truck Freight Traffic

Year	Amount (billions of ton-miles)
1986	632
1987	663
1988	700
1989	716
1990	735
1991	758
1992	815
1993	861
1994	908
1995	921

Source: *Transportation in America*

Graph the data on a scatter plot. Use the year as the independent variable and the ton-miles as the dependent variable. Draw a line of best fit, with some points on the line and others close to it.



Write a prediction equation for the data. Select two points that appear to represent the data. We chose (1990, 735) and (1993, 861).

Determine the slope of the line.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \rightarrow \frac{861 - 735}{1993 - 1990} = \frac{126}{3} \text{ or } 42$$

Use one of the ordered pairs, such as (1990, 735), and the slope in the point-slope form of the equation.

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 735 &= 42(x - 1990) \\ y &= 42x - 82{,}845 \end{aligned}$$

A prediction equation is $y = 42x - 82{,}845$. Substitute 2010 for x to estimate the average amount of freight a truck will haul in 2010.

$$\begin{aligned} y &= 42x - 82{,}845 \\ y &= 42(2010) - 82{,}845 \\ y &= 1575 \end{aligned}$$

According to this prediction equation, trucks will haul 1575 billion ton-miles in 2010.