Standard 8.SP.3 (M–H)

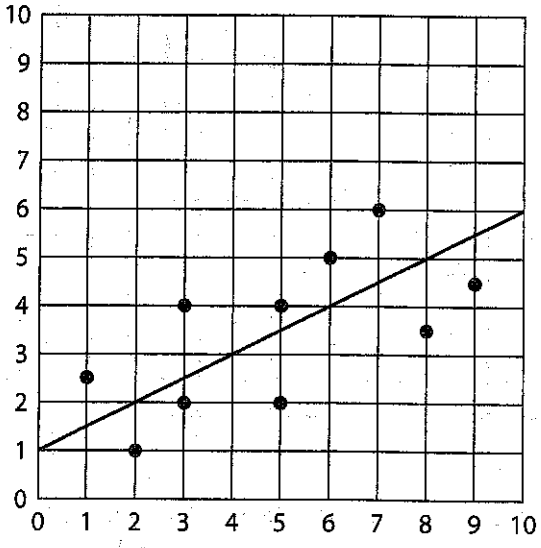
Linear Models & Linear Equations

You now know how to draw linear models, but what are they used for? Linear models allow you to make predictions and estimate solutions to problems. You do this by finding the linear equation that represents the linear model. After finding the linear equation, values can be substituted for the variables to solve problems. The solutions will not be actual points on the scatter plot, but will instead represent typical values that follow the trend of the data.

Think About It–1

- What is a linear equation?
- What is slope-intercept form?

Look at the scatter plot below.



The scatter plot includes a linear model that represents the association between the variables.

We need to find the equation of the line and write it in slope-intercept form ($y = mx + b$). So, we need to find the slope of the line (m) and the y-intercept (b).

Think About It–2

- How do you find the slope of a line?
- How do you find the y-intercept of a line?

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On Your Own–1: Find the slope and *y*-intercept of the linear model on page 76. Then, write the equation of the linear model in slope-intercept form. Show all of your work in the box below.

Slope: _____

y-intercept: _____

Equation: _____

The equation of the linear model on page 76 is $y = \frac{1}{2}x + 1$. We can use this equation to solve problems relating to the scatter plot.

Suppose we want to know the typical value of *y* when *x* is 4. We can substitute 4 for *x* in the equation and solve for *y*, as shown below.

$$y = \frac{1}{2}x + 1$$
$$y = \frac{1}{2}(4) + 1$$
$$y = 2 + 1$$
$$y = 3$$

When the *x*-value is 4, the *y*-value is 3.

On Your Own–2: What is the typical *y*-value when the *x*-value is 7? Show all of your work in the box below.

Talk About It: Why isn't 6 the answer to the item above?

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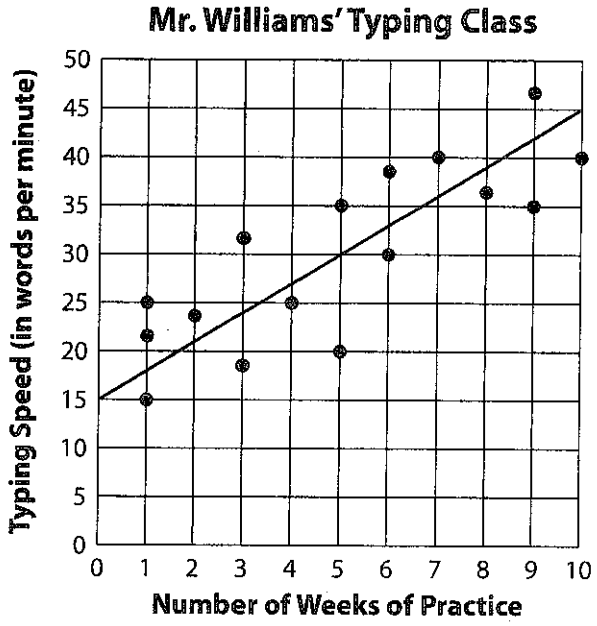
Try It: Read the problem, and look at the scatter plot below. Then, answer the questions that follow.

Mr. Williams teaches a typing class. He recorded the number of weeks each student had practiced typing and each student's typing speed. He displayed the data on the scatter plot below and drew a linear model to represent the data.



1. What is the slope of the linear model? _____
2. What is the *y*-intercept of the linear model? _____
3. What is the equation of the linear model? _____
4. What would be the typical typing speed of a student who has practiced for 7 weeks?

   _____
5. What would be the typical number of weeks of practice for a student who has a typing speed of 45 words per minute? _____
6. Explain the meaning of the slope and *y*-intercept in this problem.

   _____

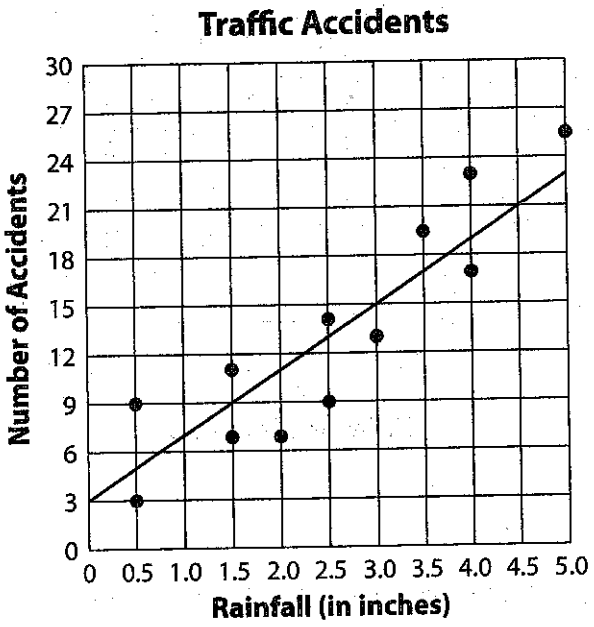
   _____

Standard 8.SP.3 (M–H)

Problem Solving I

Directions: Read each of the following problems, and study the accompanying scatter plots. Write an equation to represent the linear model. Then, answer the questions that follow.

1. City officials recorded the amount of rainfall each month and the number of traffic accidents reported each month for a year. They displayed the data on the scatter plot below and drew a linear model to represent the data.



Equation: _____

a. How many accidents typically occur in a month that has 4.5 inches of rain?

_____

b. How much rain likely falls in a month that has 6 accidents? _____

c. How many accidents typically occur in a month that has 2 inches of rain?

_____

d. Explain the meaning of the slope and *y*-intercept in this problem.

_____

_____

_____

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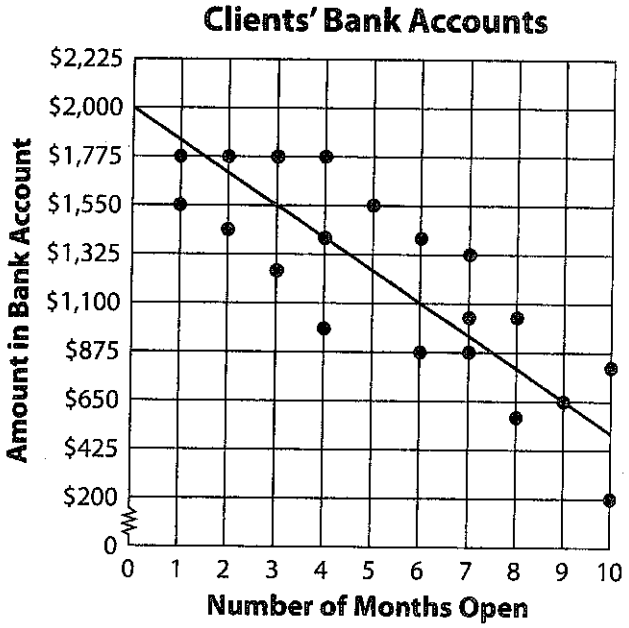
2. A bank manager recorded the amount of money in clients' bank accounts and the number of months the accounts have been open. He displayed the data on the scatter plot below and drew a linear model to represent the data.



Equation: _____

a. How much money is typically in a bank account that has been open for 5 months?

_____

b. How many months has a bank account typically been open if it holds $950?

_____

c. How much money is typically in a bank account that has been open for 9 months?

_____

d. Explain the meaning of the slope and *y*-intercept in this problem.

_____

_____

_____

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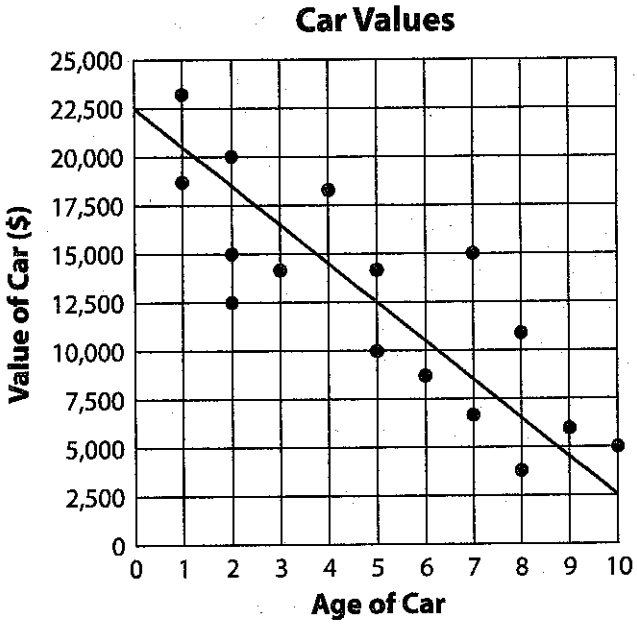
3. A used car salesperson recorded the age of cars in years and the values of those cars in dollars. He displayed the data on the scatter plot below and drew a linear model to represent the data.



Equation: _____

a. What is the expected value of a car that is 5 years old? _____

b. If a car has a value of $16,500, what is its expected age? _____

c. What is the expected value of a car that is 8 years old? _____

d. Explain the meaning of the slope and *y*-intercept in this problem.

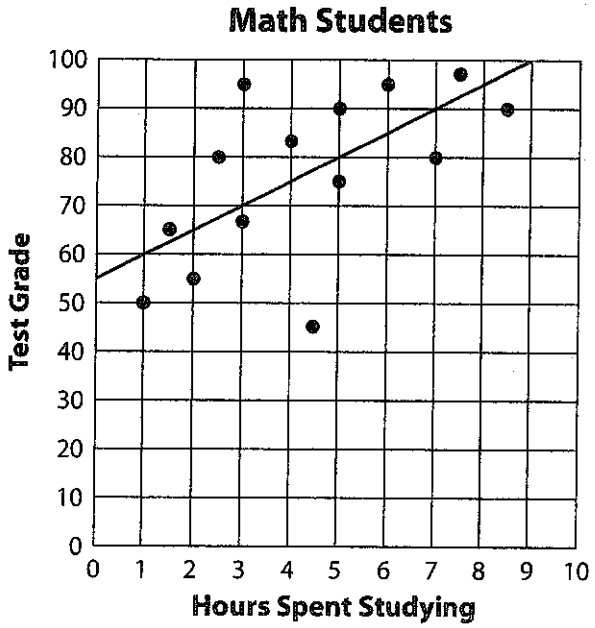
_____

_____

_____

continue to next page

4. A math teacher recorded the number of hours each student studied for a test and the grade each received on the test. She displayed the data on the scatter plot below and drew a linear model to represent the data.



Equation: _____

a. What is the expected test score for a student who studies for 6.5 hours?

_____

b. If a student receives a test score of 75, for how many hours did he or she likely study?

_____

c. What is the expected test score for a student who studies for 7 hours 15 minutes?

_____

d. Explain the meaning of the slope and *y*-intercept in this problem.

_____

_____

_____