

Lesson Check

Do you know HOW?

Make a scatter plot of each set of points and describe the correlation.

- $\{(1.2, 1), (2.5, 6), (2.5, 7.5), (4.1, 11), (7.9, 19)\}$
- $\{(1, 55), (2, 38), (3, 54), (4, 37), (5, 53), (6, 40), (7, 53), (8, 36)\}$
- Make a scatter plot for the following set of points. Describe the correlation and sketch a trend line.
 $\{(2, 58), (6, 105), (8, 88), (8, 118), (12, 117), (16, 137), (20, 157), (20, 169)\}$

Do you UNDERSTAND? MATHEMATICAL PRACTICES

- Writing** How can you determine whether two variables x and y for a real-life situation are correlated?
- Do you think a trend line on a graph is always the same as the line of best fit? Why or why not?
- Compare and Contrast** What is the difference between a positive correlation and a negative correlation? How might you relate positive correlation with direct variation?



Practice and Problem-Solving Exercises



A Practice

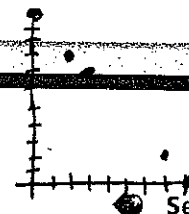
Make a scatter plot and describe the correlation.

- $\{(0, 11), (2, 8), (3, 7), (7, 2), (8, 0)\}$

Strong positive correlation

- Manufacturing** The table shows the numbering system used in Europe and the United States for shoe sizes. *strong positive correlation*

Shoe Sizes						
U.S. Size	4	3	5	7	9	11
European Size	31	34	36	39	41	44



See Problem 1.

Write the equation of a trend line.

- $\{(-10, 3), (-5, 1), (-1, -4), (3, -7), (12, -12)\}$
- $\{(-15, 8), (-8, 7), (-3, 0), (0, 0), (7, -3)\}$

- The table shows the number of hours you studied before your eight math tests and your percent score on each test.

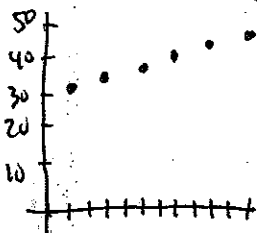
Studying Hours and Test Score								
Number of Hours	8	5	12	10	2	9	11	14
Score (%)	75	62	80	85	35	70	82	95

See Problem 2.

- Food Production** The table below shows pork production in China from 2000 to 2007. Use a calculator to find the line of best fit. *See Problem 3.*
 - Use your linear model to predict how many metric tons of pork will be produced in 2025. *91,088 metric tons*
 - Use your linear model to predict when production is likely to reach 100,000 metric tons. *≈ Year 2029*

Pork Production in China								
Year	2000	2001	2002	2003	2004	2005	2006	2007
Production (metric tons)	40,475	42,010	43,413	45,331	47,177	50,254	52,407	54,491

SOURCE: USDA Foreign Agricultural Service GAIN Report



B Apply

- © 13. **Think About a Plan** The table shows the relationship between the production and the export of rice in Vietnam from 1985 to 2005.

$y = .218x - 3157.593$
 $r = 0.964$

Rice Production and Export					
Production (1000 tonnes)	15,875	19,225	24,964	32,554	35,600
Export (1000 tonnes)	59	1624	1988	3400	5100

Source: International Rice Research Institute

How much rice would you expect Vietnam to export in 2015 if the production that year is 42,250,000 tonnes? → plug in 42,250 for x → 6055.4 thousand tonnes

- How can you use a scatter plot to find a linear model?
- How can you use your model to make a prediction?

- © 14. **Nutrition** The table shows the relationship between Calories and fat in various fast-food hamburgers.

$y = .071x - 9.268$
 $r = 0.947$

Fast Food Calories									
Restaurant	A	B	C	D	E	F	G	H	I
Number of Calories	720	530	510	500	305	410	440	320	598
Grams of fat	46	30	27	26	13	20	25	13	26

- Find the line of best fit for the relationship between Calories and fat.
- How much fat would you expect a 330-Calorie hamburger to have? → 14.3 grams
- Error Analysis** Which estimate is *not* reasonable: 10 g of fat for a 200-Calorie hamburger or 36 g of fat for a 660-Calorie hamburger? Explain.

line predicts ≈ 5 grams

- © Reasoning For any correlation, people often assume that change in one quantity *causes* change in the second quantity. This is not always true. For each situation, do you think that change in the first quantity causes change in the second quantity? What else may have affected the change in the second quantity?

- number of miles driven and fuel expenses *causes*
- the size of a car's engine and the number of passengers it is designed for
- a person's age and the number of cassette tapes he or she owns

→ not necessarily causation
 → purpose of vehicle also affects # of passengers it is designed for

- © 18. **Data Analysis** The table shows population and licensed driver statistics from a recent year.

- Make a scatter plot.
- Draw a trend line.
- The population of Michigan was approximately 10 million that year. About how many licensed drivers lived in Michigan that year?
- Writing** Is the correlation between population and number of licensed drivers strong or weak? Explain.

State	Population (millions)	Number of Drivers (millions)
Arkansas	2.8	2.0
Illinois	12.8	8.1
Kansas	2.8	2.0
Massachusetts	6.4	4.7
Pennsylvania	12.4	8.5
Texas	23.5	14.9

2.4 Practice

Find the slope of the line through each pair of points.

1. $(-3, -2)$ and $(1, 6)$

$$m = 2$$

2. $(4, -1)$ and $(-2, -3)$

$$m = \frac{1}{3}$$

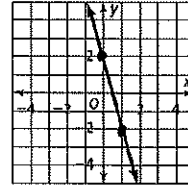
Write an equation of each line in slope intercept form.

3. $m = 4$ and the y -intercept is -3

$$y = 4x - 3$$

4.

$$y = -4x + 2$$



5. slope -5 ; through $(9, -1)$

$$y = -5x + 44$$

6. slope $\frac{2}{3}$; through $(-6, 7)$

$$y = \frac{2}{3}x + 11$$

Write in point-slope form an equation of the line through each pair of points. To start, substitute values for (x_1, y_1) and (x_2, y_2) into the slope formula. Then convert the point-slope form to slope intercept form.

7. $(2, 7)$ and $(-2, 1)$

$$m = \frac{3}{2}$$

$$y - 7 = \frac{3}{2}(x - 2)$$

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

8. $(3, -2)$ and $(1, 4)$

$$m = -3$$

$$y + 2 = -3(x - 3)$$

$$y = -3x + 7$$

Write an equation of each line in standard form with integer coefficients. To start, multiply each side by the least common denominator of all fractional coefficients.

9. $y = \frac{3}{7}x - 2$

$$-3x + 7y = -14$$

10. $y = -\frac{5}{4}x + \frac{1}{3}$

$$15x + 12y = 4$$

11. **Reasoning** The line $y + 4 = \frac{3}{4}(x - 8)$ contains point $(a, 2)$. Find a . Show your work.

$$a = 16$$

12. Rosa must read 20 pages of a book for English class. It will take Rosa about 50 minutes to complete her reading. Let $x =$ *the number minutes spent reading* and $y =$ *number of pages read*. Draw a graph and write an equation to represent the situation (Hint: if you have read for 0 minutes, how many pages have you read?). According to your equation, how long will it take Rosa to read 30 pages?

$$(0,0) \quad (50,20)$$

$$y = \frac{2}{5}x$$

$$30 = \frac{2}{5}x$$

$$75 \text{ minutes} = x$$

Write an equation in slope-intercept form for each line.

13. the line parallel to $y = 4x - 1$ through ~~(2, -7)~~ $(2, -7)$

$$y = 4x - 15$$

14. the line perpendicular to $y = -\frac{1}{3}x + 5$ through $(6, 3)$

$$y = 3x - 15$$