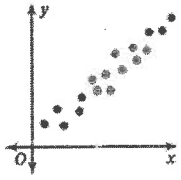
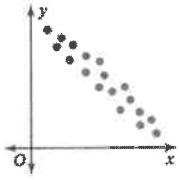
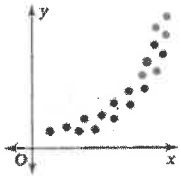
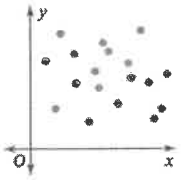
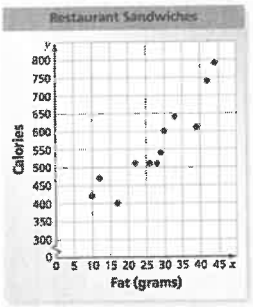
Name _____ Period _____

Chapter 9 Pre-Algebra	Data Analysis and Displays
MAFS.8.SP.1.1	• Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. • Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
MAFS.8.SP.1.2	• Know that straight lines are widely used to model relationships between two quantitative variables. • For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
MAFS.8.SP.1.3	• Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
MAFS.8.SP.1.4	• Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. • Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. • Use relative frequencies calculated for rows or columns to describe possible association between the two variables.
Essential Question	How can you construct and interpret a scatter plot?
Learning Targets	In this lesson, I will • Construct and interpret scatter plots. • Describe patterns in scatter plots.
9.1 Scatter Plots	**Scatter Plot** **A scatter plot is a graph that shows the relationship between two data sets. The two sets of data are graphed as ordered pairs in a coordinate plane.**

A scatter plot can show that a relationship exists between two data sets.

Positive Linear Relationship	*Negative Linear Relationship*	*Nonlinear Relationship*	*No Relationship*
			
The points lie close to a line. As x increases, y increases.	The points lie close to a line. As x increases, y decreases.	The points lie in the shape of a curve.	The points show no pattern.

Example 1 Interpreting a Scatter Plot



The scatter plot at the left shows the amounts of fat (in grams and the numbers of calories in 12 restaurant sandwiches.

a. How many calories are in the sandwich that contains 17 grams of fat? _____

b. How many grams of fat are in the sandwich that contains 600 calories?

c. What tends to happen to the number of calories as the number of grams of fat increases?

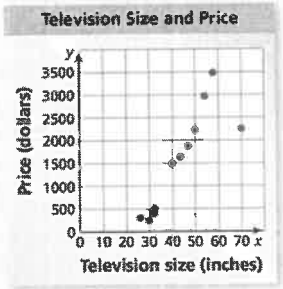
On Your Own

1. **WHAT IF?** A sandwich has 650 calories. Based on the scatter plot in Example 1, how many grams of fat would you expect the sandwich to have? Explain your reasoning.

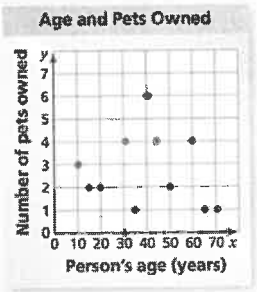
Example 2 Identifying Relationships

Describe the relationship between the data. Identify any outliers, gaps, or clusters.

a. television size and price



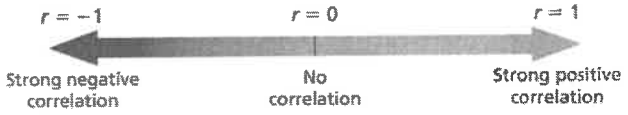
b. age and number of pets owned



On Your Own

2. Make a scatter plot of the data and describe the relationship between the data. Identify any outliers, gaps, or clusters.

Study Time (min), x	30	20	60	90	45	10	30	75	120	80
Test Score, y	80	74	92	97	85	62	83	90	70	91

Essential Question	How can you use data to predict an event?
Learning Targets	In this lesson, I will • Find lines of fit • Use lines of fit to solve problems
9.2 Lines of Fit	A **line of fit** is a line drawn on a scatter plot close to most of the data points. It can be used to estimate data on a graph. Graphing calculators use a method called *linear regression* to find a precise line of fit called a **line of best fit.** This line best models a set of data. A calculator often gives a value r called the *correlation coefficient.* This value tells whether the correlation is positive or negative, and how closely the equation models the data. Values of r range from -1 to 1. When r is close to 1 or -1, there is a strong correlation between the variables. As r gets closer to 0, the correlation becomes weaker. 
Example 1 Finding a Line of Fit	**The table shows the depth of a river x months after a monsoon season ends. (a) Make a scatter plot of the data and draw a line of fit. (b) Write an equation of the line of fit. (c) Interpret the slope and the y-intercept of the line of fit. (d) Predict the depth in month 9.** **Month, x** / **Depth (feet), y** 0 / 20 1 / 19 2 / 15 3 / 13 4 / 11 5 / 10 6 / 8 7 / 7 8 / 5
On Your Own	1. The table shows the numbers of people who have attended a festival over an 8-year period. (a) Make a scatter plot of the data and draw a line of fit. (b) Write an equation of the line of fit. (c) Interpret the slope and the y-intercept of the line of fit. (d) Predict the number of people who will attend the festival in year 10. **Year, x**: 1	2	3	4	5	6	7	8 **Attendance, y**: 420	500	650	900	1100	1500	1750	2400
Essential Question	How can you read and make a two-way table?
Learning Targets	In this lesson, you will • Read two-way tables • Make and interpret two-way tables
9.3 Two-Way Tables	A **two-way table** displays two categories of data collected from the same source. You randomly survey students in your school about their grades on the last test and whether they studied for the test. The two-way table shows your results. Each entry in the table is called a **joint frequency.** 			Student	
---	---	---	---
		Studied	**Did Not Study**
Grade	**Passed**	21	2
	Failed	1	6	 joint frequency

	The sums of the rows and columns in a two-way table are called **marginal frequencies.**
Example 1 Reading a Two-Way Table	**How many of the students in the survey above studied for the test and passed?**
Example 2 Finding Marginal Frequencies	**Find and interpret the marginal frequencies for the survey above.**
On Your Own	1. You randomly survey students in a cafeteria about their plans for a football game and a school dance. The two-way table shows your results. **a.** How many students will attend the dance but not the football game? **b.** Find and interpret the marginal frequencies for the survey.

		Football Game	
		Attend	Not Attend
Dance	Attend	35	5
	Not Attend	16	20

Example 3 Making a Two-Way Table	**You randomly survey students between the ages of 12 and 17 about whether they ride the bus to school. The results are shown in the tally sheets. Make a two-way table that includes the marginal frequencies.**

Rides Bus

Age	Tally
12-13	
14-15	
16-17	

Does Not Ride Bus

Age	Tally
12-13	
14-15	
16-17	

Example 4 Finding a Relationship in a Two-Way Table	**Use the two-way table in Example 3.** **a.** For each age group, what percent of the students in the survey ride the bus to school? do not ride the bus to school? Organize the results in a two-way table. Explain what one of the entries represents. **b.** Does the table in part (a) show a relationship between age and whether students ride the bus to school? Explain.
On Your Own	2. You randomly survey students in a school about whether they buy a school lunch or pack a lunch. Your results are shown. **a.** Make a two-way table that includes the marginal frequencies. **b.** For each grade level, what percent of the students in the survey pack a lunch? buy a school lunch? Organize the results in a two-way table. Explain what one of the entries represents. **c.** Does the table in part (b) show a relationship between grade level and lunch choice? Explain.

Grade 6 Students
11 pack lunch, 9 buy school lunch

Grade 7 Students
23 pack lunch, 27 buy school lunch

Grade 8 Students
16 pack lunch, 14 buy school lunch

Name_____ Date_____

9.1 Practice A

Describe the relationship you would expect between the data. Explain.

1. age of the automobile and the odometer reading
2. time spent fishing and the amount of bait in the bucket
3. number of passengers in a car and the number of traffic lights on the route
4. The table shows the heights (in feet) of the waves at a beach and the numbers of surfers at the beach.

Wave Height	3	6	5	1
Number of Surfers	24	61	56	15

   a. Write the ordered pairs from the table and plot them in a coordinate plane.

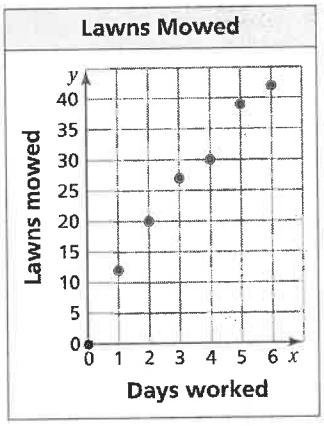
   b. Describe the relationship between the two data sets.

5. The scatter plot shows the numbers of lawns mowed by a local lawn care business during one week.

   a. How many days does it take to mow 30 lawns?

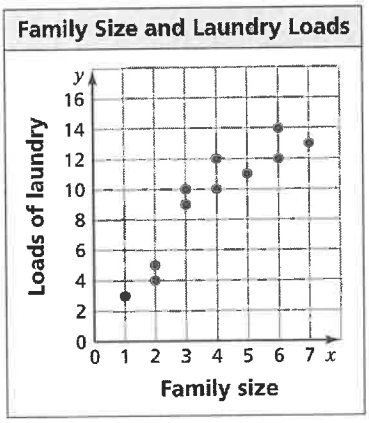
   b. About how many lawns can be mowed in 1 day?

   c. Describe the relationship shown by the data.



Describe the relationship between the data. Identify any outliers, gaps, or clusters.

6.



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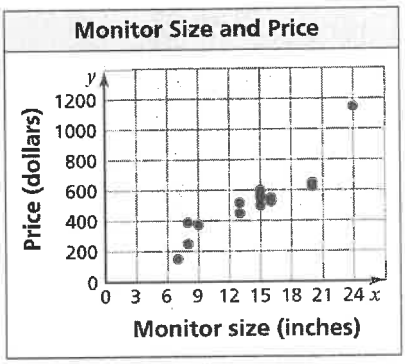
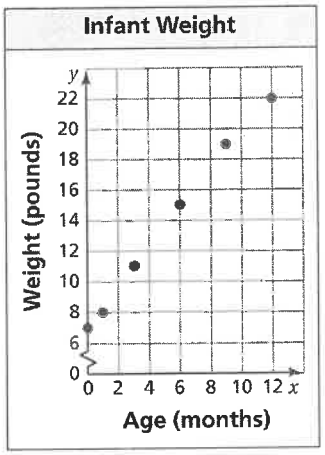


Name_____ Date_____

9.2 Practice A

1. The scatter plot shows the weights y of an infant from birth through x months.



   a. At what age did the infant weigh 11 pounds?

   b. What was the infant's weight at birth?

   c. Draw a line that you think best approximates the points.

   d. Write an equation for your line.

   e. Use the equation to predict the weight of the infant at 18 months.

   f. Does the data show a *positive*, a *negative*, or *no* relationship?

2. The table shows the numbers of losses y a gamer has x weeks after getting a new video game.

Week, x	1	2	3	4	5	6	7
Losses, y	15	12	10	7	6	3	1

   a. Make a scatter plot of the data.

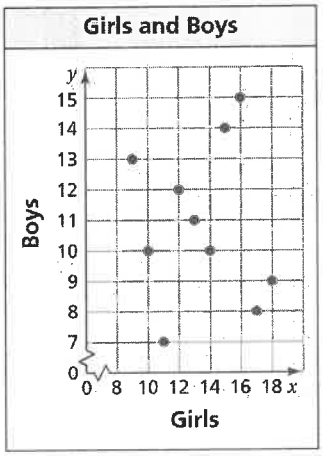
   b. Draw a line of fit.

   c. Write an equation of the line of fit.

   d. Does the data show a *positive*, a *negative*, or *no* relationship?

   e. Interpret the relationship.

3. The scatter plot shows the relationship between the numbers of girls and the numbers of boys in 10 different classrooms.



   a. What type of relationship, if any, does the data show?

   b. Is it possible to find the line of fit for the data? Explain.

   c. Is it reasonable to use this scatter plot to predict the number of boys in the classroom based on the number of girls? Explain.

Name_____ Date_____

9.3 Practice A

1. The two-way table shows the results of a football team's home games over the last five seasons and whether the stadium roof was open or closed.

		Stadium Roof	
		Open	**Closed**
Result	Win	25	7
	Loss	8	0

a. How many home games did the team win?

b. How many home games did the team lose with a closed roof?

c. Find and interpret the marginal frequencies.

d. What percent of the total home games did the team win with an open roof?

2. You randomly survey students in a school about whether they prefer cats or dogs as pets. The results are shown in the tally sheets. Make a two-way table including the totals of the rows and columns.

Male Students

Pet	Tally
Dogs	𝍸 𝍸 𝍸 ||
Cats	𝍸 |||

Female Students

Pet	Tally
Dogs	𝍸 𝍸 ||||
Cats	𝍸 𝍸 𝍸 𝍸

3. You randomly survey people in the mall about whether or not they regularly use text messaging. The results are shown in the tally sheets.

Texts Regularly

Age	Tally
20-29	𝍸 𝍸 𝍸 𝍸
30-39	𝍸 𝍸 |
40-49	||

Does Not Text Regularly

Age	Tally
20-29	𝍸 ||
30-39	𝍸 𝍸 |||
40-49	𝍸 𝍸

a. Make a two-way table that includes the marginal frequencies.

b. For each age group, what percent of the people in the survey text regularly? do not text regularly? Organize the results in a two-way table. Explain what one of the entries represents.

c. Does the table in part (b) show a relationship between age and texting? Explain.

9 Chapter Test

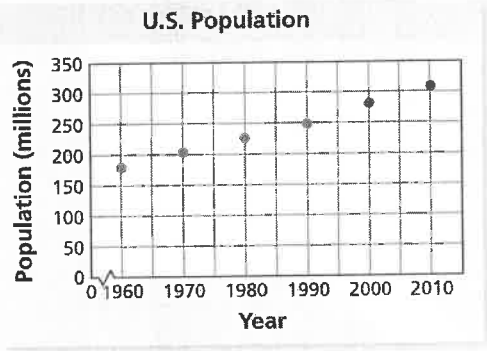
Check It Out
Test Practice
BigIdeasMath.com

1. **POPULATION** The graph shows the population (in millions) of the United States from 1960 to 2010.

   a. In what year was the population of the United States about 180 million?

   b. What was the approximate population of the United States in 1990?

   c. Describe the trend shown by the data.



2. **WEIGHT** The table shows the weight of a baby over several months.

   a. Make a scatter plot of the data and draw a line of fit.

   b. Write an equation of the line of fit.

   c. Interpret the slope and the y-intercept of the line of fit.

   d. Predict how much the baby will weigh at 7 months.

Age (months)	Weight (pounds)
1	8
2	9.25
3	11.75
4	13
5	14.5
6	16

		Nonfiction	
		Likes	Dislikes
Fiction	Likes	26	20
	Dislikes	22	2

3. **READING** You randomly survey students at your school about what type of books they like to read. The two-way table shows your results. Find and interpret the marginal frequencies.

Choose an appropriate data display for the situation. Explain your reasoning.

4. magazine sales grouped by price

5. the distance a person hikes each week

6. **SAT** The table shows the numbers y of students (in thousands) who took the SAT from 2006 to 2010, where $x = 6$ represents the year 2006. Use a graphing calculator to find an equation of the line of best fit. Identify and interpret the correlation coefficient.

Year, x	6	7	8	9	10
Number of Students, y	1466	1495	1519	1530	1548

7. **RECYCLING** You randomly survey shoppers at a supermarket about whether they use reusable bags. Of 60 male shoppers, 15 use reusable bags. Of 110 female shoppers, 60 use reusable bags. Organize your results in a two-way table. Include the marginal frequencies.