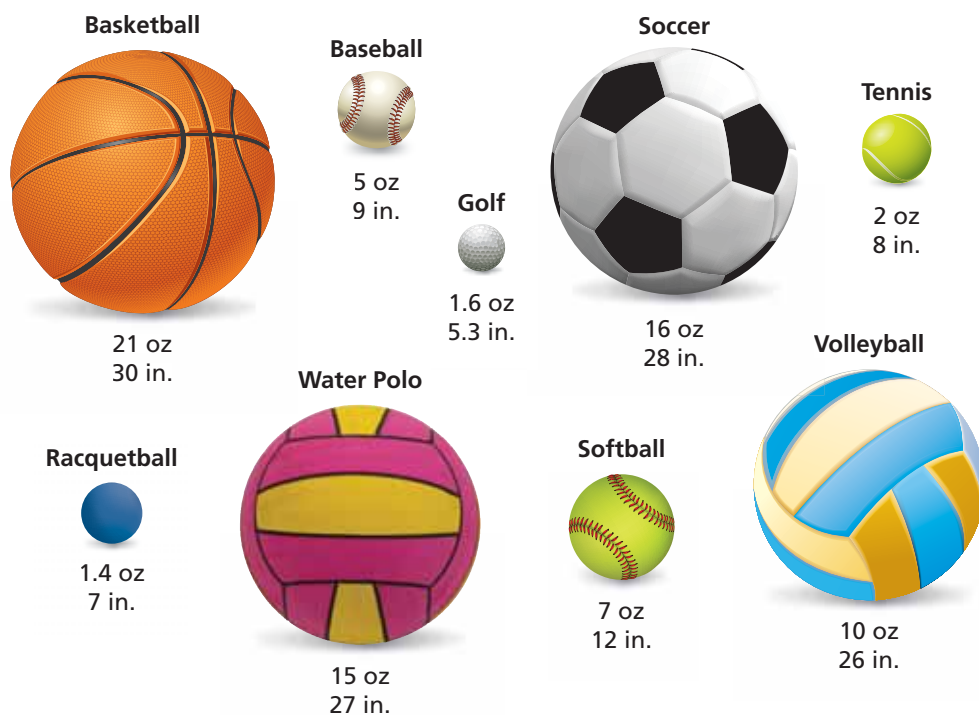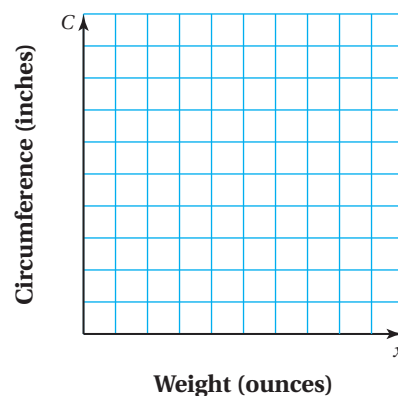# 9.1 Scatter Plots

**Essential Question** How can you construct and interpret a scatter plot?

## 1 ACTIVITY: Constructing a Scatter Plot

**Work with a partner. The weights $x$ (in ounces) and circumferences $C$ (in inches) of several sports balls are shown.**

**Basketball**
21 oz
30 in.

**Baseball**
5 oz
9 in.

**Golf**
1.6 oz
5.3 in.

**Soccer**
16 oz
28 in.

**Tennis**
2 oz
8 in.

**Racquetball**
1.4 oz
7 in.

**Water Polo**
15 oz
27 in.

**Softball**
7 oz
12 in.

**Volleyball**
10 oz
26 in.

**a.** Choose a scale for the horizontal axis and the vertical axis of the coordinate plane shown.

**b.** Write the weight $x$ and circumference $C$ of each ball as an ordered pair. Then plot the ordered pairs in the coordinate plane.

**c.** Describe the relationship between weight and circumference. Are any of the points close together?

**d.** In general, do you think you can describe this relationship as *positive* or *negative*? *linear* or *nonlinear*? Explain.

**e.** A bowling ball has a weight of 225 ounces and a circumference of 27 inches. Describe the location of the ordered pair that represents this data point in the coordinate plane. How does this point compare to the others? Explain your reasoning.

*C* Circumference (inches)

Weight (ounces)

*x*

**2  ACTIVITY: Constructing a Scatter Plot**

**Work with a partner. The table shows the number of absences and the final grade for each student in a sample.**

| Absences | Final Grade |
|----------|-------------|
| 0        | 95          |
| 3        | 88          |
| 2        | 90          |
| 5        | 83          |
| 7        | 79          |
| 9        | 70          |
| 4        | 85          |
| 1        | 94          |
| 10       | 65          |
| 8        | 75          |

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

**b.** Describe the relationship between absences and final grade. How is this relationship similar to the relationship between weight and circumference in Activity 1? How is it different?

**c.** **MODELING** A student has been absent 6 days. Use the data to predict the student's final grade. Explain how you found your answer.
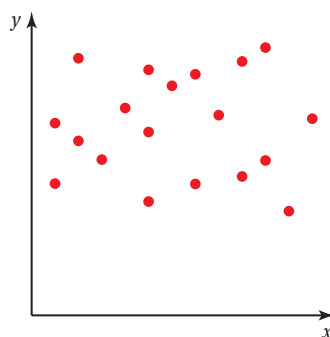
**3  ACTIVITY: Identifying Scatter Plots**

**Work with a partner. Match the data sets with the most appropriate scatter plot. Explain your reasoning.**

**a.** month of birth and birth weight for infants at a day care

**b.** quiz score and test score of each student in a class
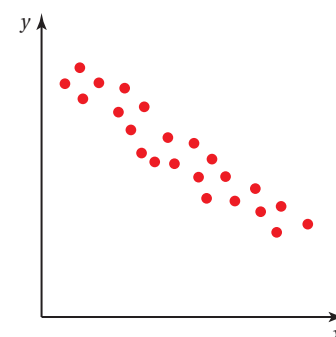
**c.** age and value of laptop computers

**i.**
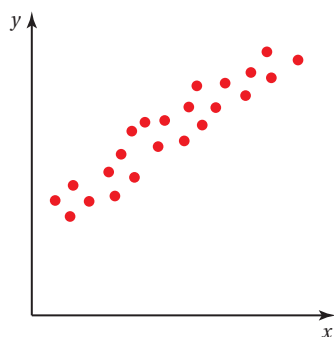


**ii.**



**iii.**



## What Is Your Answer?

**4.** How would you define the term *scatter plot*?

**5.** **IN YOUR OWN WORDS** How can you construct and interpret a scatter plot?

**Practice** ▶ Use what you learned about scatter plots to complete Exercise 7 on page 376.

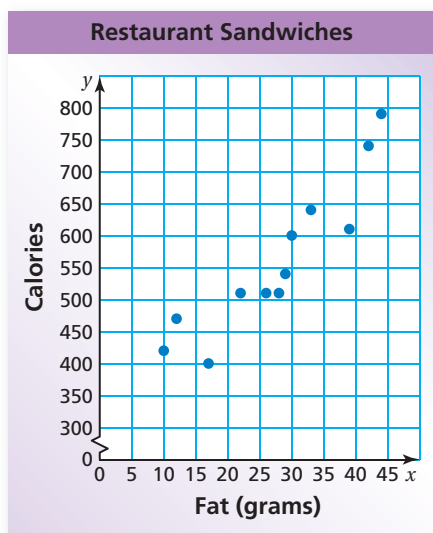**Check It Out**
Lesson Tutorials
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**Key Vocabulary** 🔊
scatter plot, *p. 374*

🔑 **Key Idea**

**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.

**EXAMPLE** **1** **Interpreting a Scatter Plot**

**Restaurant Sandwiches**



**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?

Draw a horizontal line from the point that has an *x*-value of 17. It crosses the *y*-axis at 400.

⋮ So, the sandwich has 400 calories.

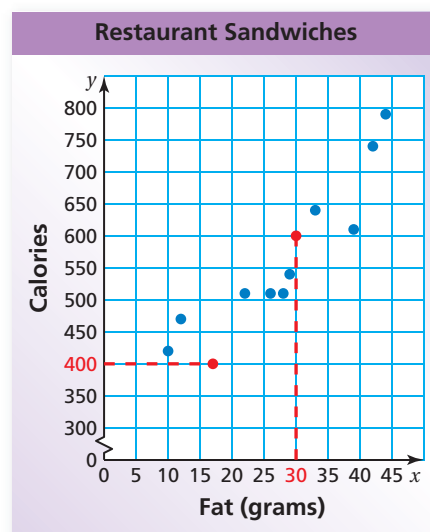**b.** How many grams of fat are in the sandwich that contains 600 calories?

Draw a vertical line from the point that has a *y*-value of 600. It crosses the *x*-axis at 30.

**Restaurant Sandwiches**



⋮ So, the sandwich has 30 grams of fat.

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

Looking at the graph, the plotted points go up from left to right.

⋮ So, as the number of grams of fat increases, the number of calories increases.
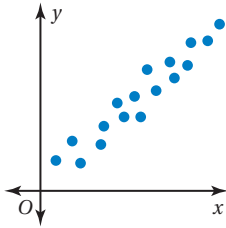
🔴 **On Your Own**

*Now You're Ready*
Exercises 8 and 9

**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.
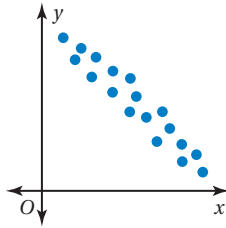
🔊 **Multi-Language Glossary at BigIdeasMath✓com**

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

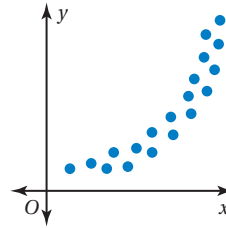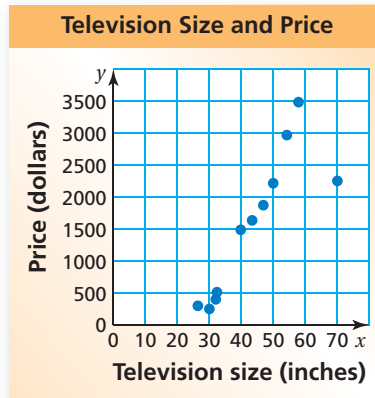| *Positive Linear Relationship* | *Negative Linear Relationship* | *Nonlinear Relationship* | *No Relationship* |
|---|---|---|---|
|  |  |  |  |
| The points lie close to a line. As *x* increases, *y* increases. | The points lie close to a line. As *x* increases, *y* decreases. | The points lie in the shape of a curve. | The points show no pattern. |
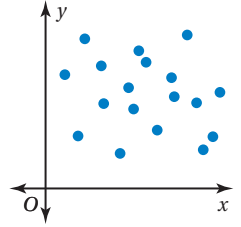
**EXAMPLE 2** **Identifying Relationships**

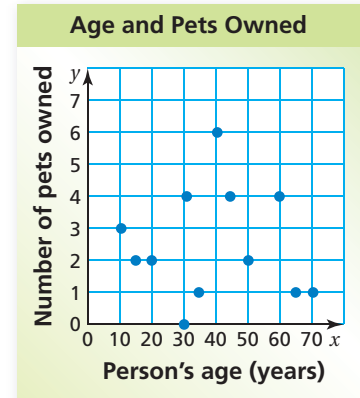Describe the relationship between the data. Identify any outliers, gaps, or clusters.

**a.** television size and price

**b.** age and number of pets owned



**Television Size and Price**



**Age and Pets Owned**

The points appear to lie close to a line. As *x* increases, *y* increases.

The points show no pattern.

⋮ So, the scatter plot shows a positive linear relationship. There is an outlier at (70, 2250), a cluster of data under $500, and a gap in the data from $500 to $1500.

⋮ So, the scatter plot shows no relationship. There are no obvious outliers, gaps, or clusters in the data.

**On Your Own**

*Now You're Ready*
Exercises 10–12

**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 |

## ✓ Vocabulary and Concept Check

1. **VOCABULARY** What type of data do you need to make a scatter plot? Explain.

2. **REASONING** How can you identify an outlier in a scatter plot?

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

3. shoe size of a student and the student's IQ

4. time since a train's departure and the distance to its destination

5. height of a bouncing ball and the time since it was dropped

6. number of toppings on a pizza and the price of the pizza
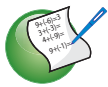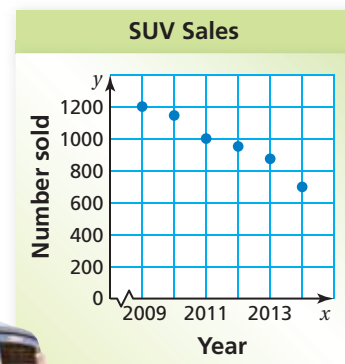
## Practice and Problem Solving

7. **JEANS** The table shows the average price (in dollars) of jeans sold at different stores and the number of pairs of jeans sold at each store in one month.

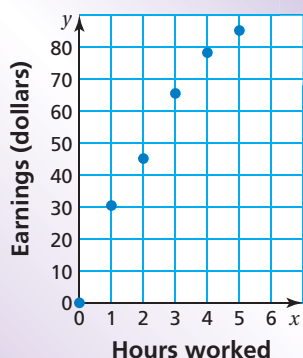| Average Price | 22 | 40 | 28 | 35 | 46 |
|---|---|---|---|---|---|
| Number Sold | 152 | 94 | 134 | 110 | 81 |

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

   b. Describe the relationship between the two data sets.

1️⃣ 8. **SUVS** The scatter plot shows the numbers of sport utility vehicles sold in a city from 2009 to 2014.

   a. In what year were 1000 SUVs sold?

   b. About how many SUVs were sold in 2013?

   c. Describe the relationship shown by the data.

**SUV Sales**



9. **EARNINGS** The scatter plot shows the total earnings (wages and tips) of a food server during one day.

   a. About how many hours must the server work to earn $70?

   b. About how much did the server earn for 5 hours of work?

   c. Describe the relationship shown by the data.

**Earnings of a Food Server**

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

**② 10.**



**11.**



**12.**
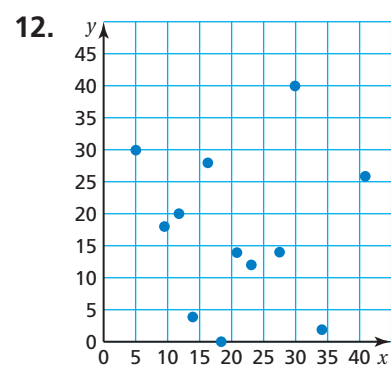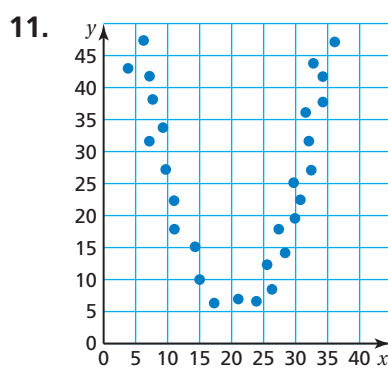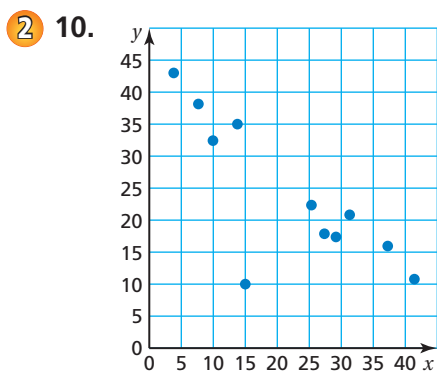


**13. HONEY** The table shows the average price per pound for honey in the United States from 2009 to 2012. What type of relationship do the data show?

| Year, *x* | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|
| Average Price per Pound, *y* | $4.65 | $4.85 | $5.15 | $5.53 |

**14. TEST SCORES** The scatter plot shows the numbers of minutes spent studying and the test scores for a science class. (a) What type of relationship do the data show? (b) Interpret the relationship.



**Study Time and Test Scores**
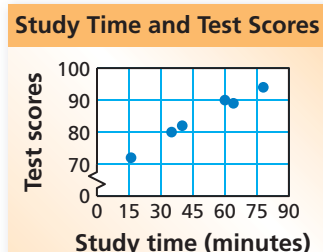
**15. OPEN-ENDED** Describe a set of real-life data that has a negative linear relationship.

**16. PROBLEM SOLVING** The table shows the memory capacities (in gigabytes) and prices (in dollars) of 7-inch tablet computers at a store. (a) Make a scatter plot of the data. Then describe the relationship between the data. (b) Identify any outliers, gaps, or clusters. Explain why you think they exist.

| Memory (GB), *x* | 8 | 16 | 4 | 32 | 4 | 16 | 4 | 8 | 16 | 8 | 16 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Price (dollars), *y* | 200 | 230 | 120 | 250 | 100 | 200 | 90 | 160 | 150 | 180 | 220 | 150 |

**17. Reasoning** Sales of sunglasses and beach towels at a store show a positive linear relationship in the summer. Does this mean that the sales of one item *cause* the sales of the other item to increase? Explain.

**Fair Game Review** *What you learned in previous grades & lessons*

**Use a graph to solve the equation. Check your solution.** *(Section 5.4)*

**18.** $5x = 2x + 6$

**19.** $7x + 3 = 9x - 13$

**20.** $\frac{2}{3}x = -\frac{1}{3}x - 4$

**21. MULTIPLE CHOICE** When graphing a proportional relationship represented by $y = mx$, which point is not on the graph? *(Section 4.3)*

Ⓐ $(0, 0)$     Ⓑ $(0, m)$     Ⓒ $(1, m)$     Ⓓ $(2, 2m)$