## Essential Question How do histograms show the differences in distributions of data?
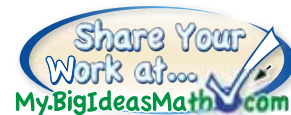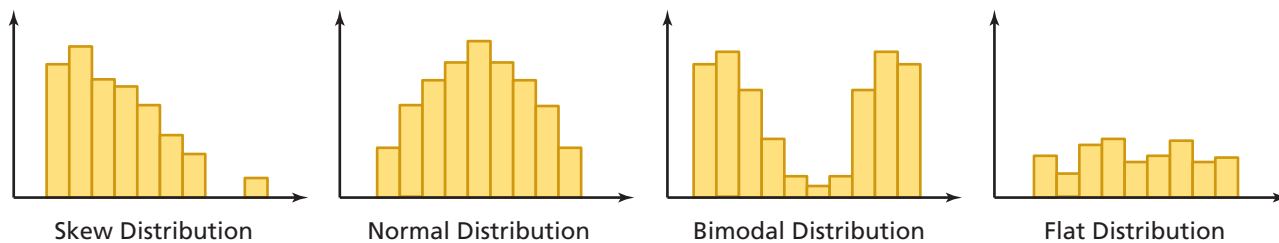
### 1 ACTIVITY: Analyzing Distributions

**Work with a partner. The graphs (histograms) show four different types of distributions.**

Skew Distribution          Normal Distribution          Bimodal Distribution          Flat Distribution

**a.** Describe a real-life example of each distribution.

**b.** Describe the mean, median, and mode of each distribution.

**c.** In which distributions are the mean and median about equal? Explain your reasoning.

**d.** How did each type of distribution get its name?

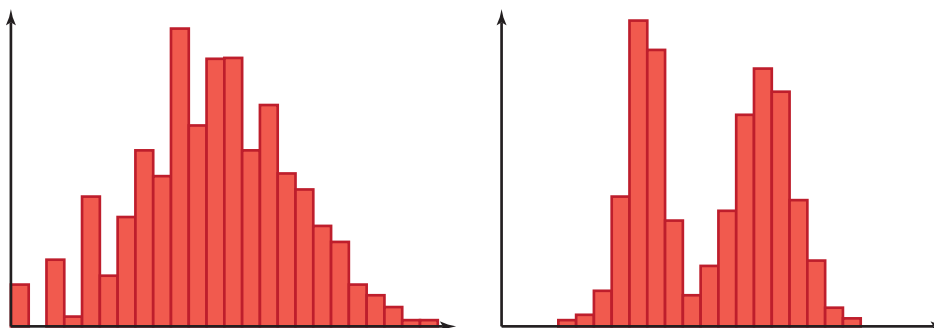### 2 ACTIVITY: Analyzing Distributions

**Work with a partner. A survey asked 100 adult men and 100 adult women to answer the following questions.**
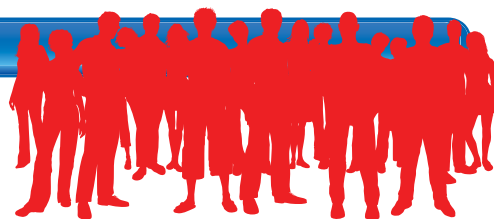
Question 1: What is your ideal weight?
Question 2: What is your ideal age?

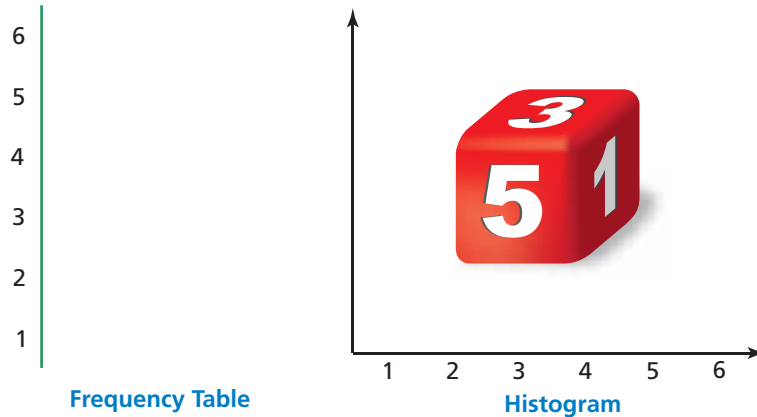**Match the histogram to the question.**

**Work with a partner. Conduct two experiments. Make a frequency table and a histogram for each experiment. Compare and contrast the results of the two experiments.**

**a.** Toss one number cube 36 times. Record the numbers.

6
5
4
3
2
1

**Frequency Table**

1  2  3  4  5  6

**Histogram**

**b.** Toss two number cubes 36 times. Record the sums of the two numbers.

12
11
10
9
8
7
6
5
4
3
2

**Frequency Table**

2  3  4  5  6  7  8  9  10  11  12
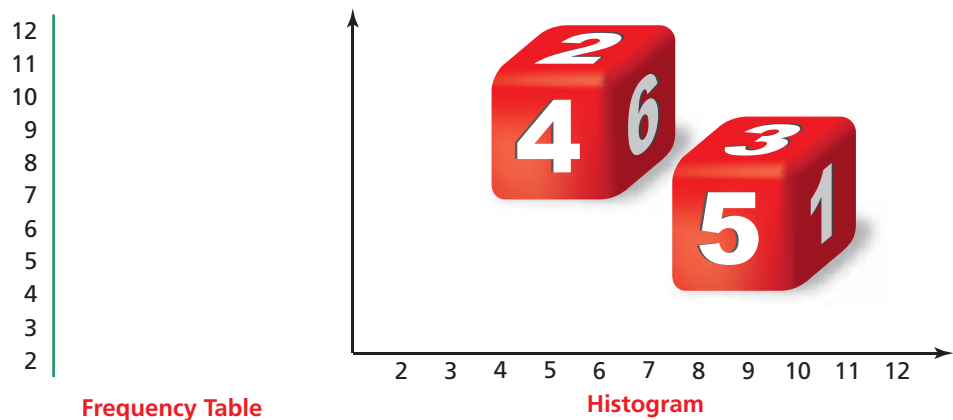
**Histogram**

## What Is Your Answer?

**4. IN YOUR OWN WORDS** How do histograms show the differences in distributions of data?

**5.** Describe an experiment that you can conduct to collect data. Predict the type of data distribution the results will create.

**Practice**

Use what you learned about histograms to complete Exercises 4 and 5 on page 358.
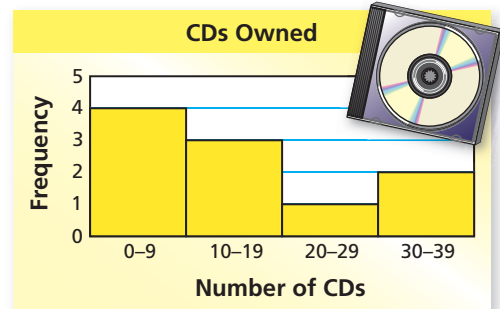
**Key Vocabulary** 🔊
histogram, *p. 356*

## 🔑 Key Idea

**Histograms**

A **histogram** is a bar graph that shows the frequency of data values in intervals of the same size.

The height of a bar represents the frequency of the values in the interval.

**CDs Owned**

Frequency vs Number of CDs

## EXAMPLE 1 — Making a Histogram

**The frequency table shows the number of pairs of shoes that each person in a class owns. Display the data in a histogram.**

**Remember**
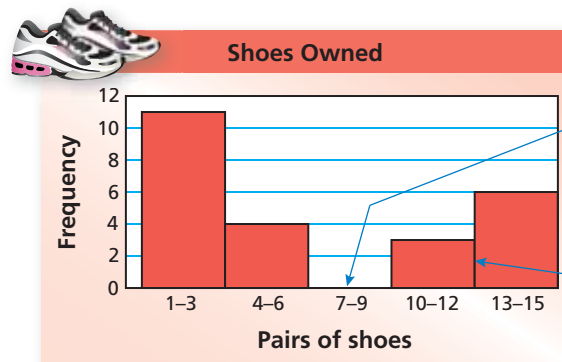
A *frequency table* groups data values into intervals. The *frequency* is the number of data values in an interval.

**Step 1:** Draw and label the axes.

**Step 2:** Draw a bar to represent the frequency of each interval.

| Pairs of Shoes | Frequency |
|---|---|
| 1–3 | 11 |
| 4–6 | 4 |
| 7–9 | 0 |
| 10–12 | 3 |
| 13–15 | 6 |

**Shoes Owned**

Include any interval with a frequency of 0. The bar height is 0.

There is no space between the bars of a histogram.

## 🔴 On Your Own

**Now You're Ready**
Exercises 6–8

**1.** The frequency table shows the ages of people riding a roller coaster. Display the data in a histogram.

| Age | 10–19 | 20–29 | 30–39 | 40–49 | 50–59 |
|---|---|---|---|---|---|
| Frequency | 16 | 11 | 5 | 2 | 4 |

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

EXAMPLE **2** Using a Histogram

**The histogram shows the winning speeds at the Daytona 500. (a) Which interval contains the most data values? (b) How many of the winning speeds are less than 140 miles per hour? (c) How many of the winning speeds are at least 160 miles per hour?**

**Daytona 500 Winning Speeds**
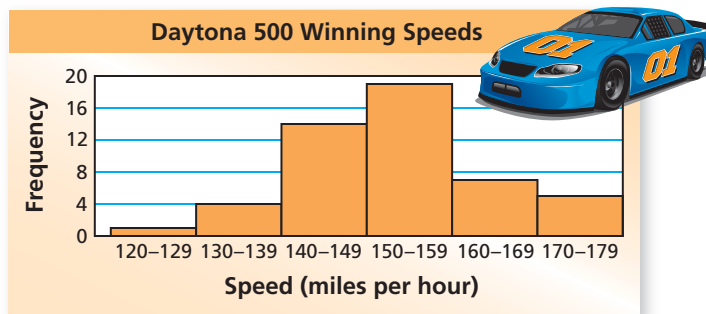


**a.** The interval with the tallest bar contains the most data values.

∴ So, the 150–159 miles per hour interval contains the most data values.

**b.** One winning speed is in the 120–129 miles per hour interval and four winning speeds are in the 130–139 miles per hour interval.

∴ So, $1 + 4 = 5$ winning speeds are less than 140 miles per hour.

**c.** Seven winning speeds are in the 160–169 miles per hour interval and five winning speeds are in the 170–179 miles per hour interval.

∴ So, $7 + 5 = 12$ winning speeds are at least 160 miles per hour.

## On Your Own

*Now You're Ready*
Exercises 9–11

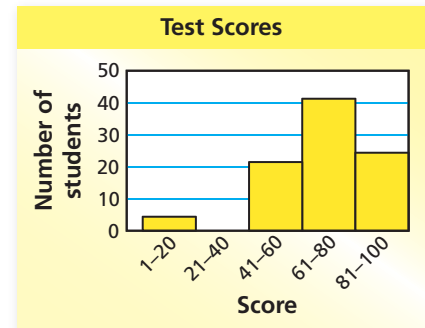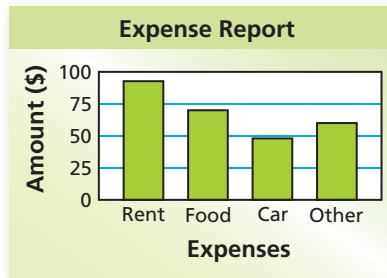**2.** The histogram shows the number of hours that students in a class slept last night.

**a.** How many students slept at least 8 hours?

**b.** How many students slept less than 12 hours?

**Amount of Sleep**
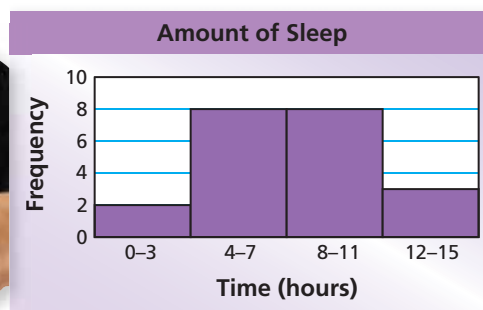
## Vocabulary and Concept Check

1. **VOCABULARY** Which graph is a histogram? Explain your reasoning.

2. **REASONING** Describe the outliers in the histogram.

3. **CRITICAL THINKING** How can you tell when an interval of a histogram has a frequency of zero?

**Expense Report**

Amount ($): 100, 75, 50, 25, 0

Expenses: Rent, Food, Car, Other

**Test Scores**

Number of students: 50, 40, 30, 20, 10, 0

Score: 1–20, 21–40, 41–60, 61–80, 81–100

## Practice and Problem Solving

**Determine the type of distribution shown by the histogram.**

4.



5.
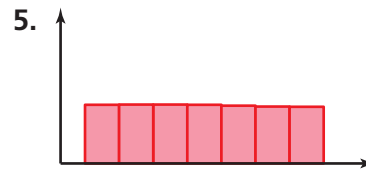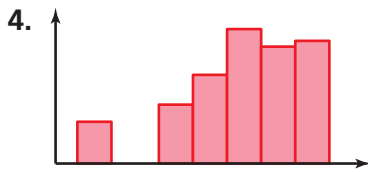


**Display the data in a histogram.**

① 6.

| States Visited | |
|---|---|
| States | Frequency |
| 1–5 | 12 |
| 6–10 | 14 |
| 11–15 | 6 |
| 16–20 | 3 |

7.

| Chess Team | |
|---|---|
| Wins | Frequency |
| 10–13 | 3 |
| 14–17 | 4 |
| 18–21 | 4 |
| 22–25 | 2 |

8.

| Movies Watched | |
|---|---|
| Movies | Frequency |
| 0–1 | 5 |
| 2–3 | 11 |
| 4–5 | 8 |
| 6–7 | 1 |

② 9. **MAGAZINES** The histogram shows the number of magazines read last month by students in a class.

   a. Which interval contains the fewest data values?

   b. How many students are in the class?

   c. What percent of the students read less than six magazines?

**Magazines**

Frequency: 18, 15, 12, 9, 6, 3, 0

Magazines read: 0–1, 2–3, 4–5, 6–7
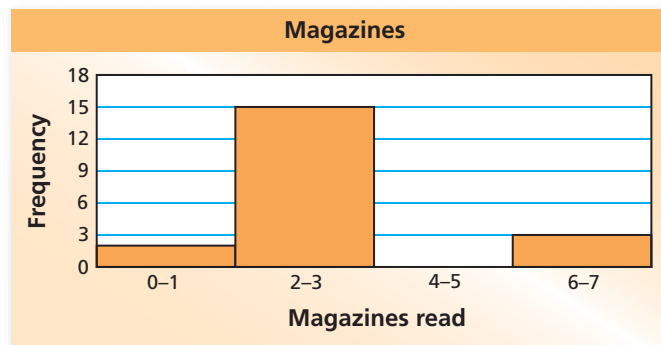
**10. VOTING** The histogram shows the percent of the voting age population that voted in a recent presidential election. Explain whether each statement is supported by the graph.



**Presidential Election**

a. Only 40% of one state voted.

b. Most states had between 50% and 64.9% that voted.
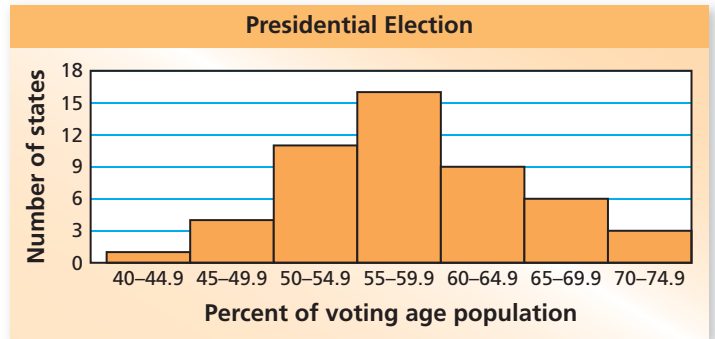
**11. AREA** The histograms show the areas of counties in Pennsylvania and Indiana. Which state do you think has the greater area? Explain.



Pennsylvania



Indiana
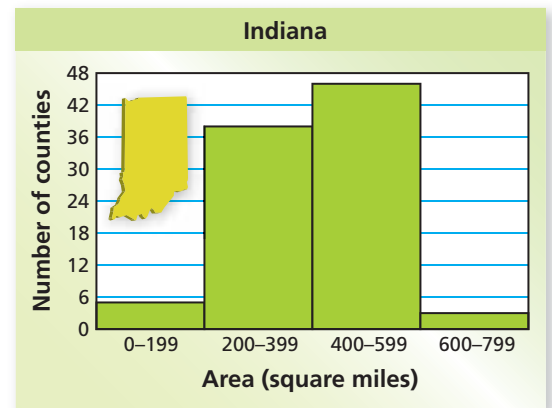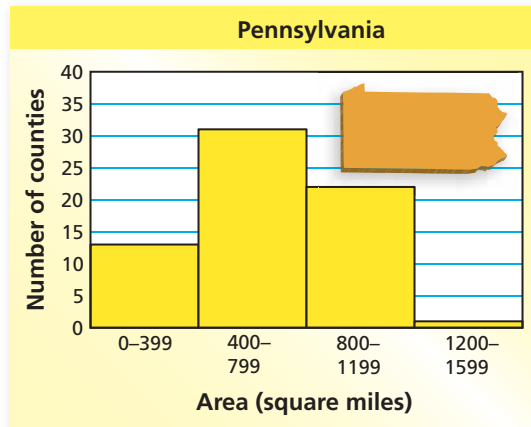
**12. REASONING** Can you find the mean, median, mode, and range of the data in Exercise 7? If so, find them. If not, explain why.

**13.** 🌟Critical Thinking🌟 The table shows the weights of guide dogs enrolled in a training program.

a. Make a histogram of the data starting with the interval 51–55.

b. Make another histogram of the data using a different sized interval.

c. Compare and contrast the two histograms.

| Weight (lb) | | | | | |
|----|----|----|----|----|----|
| 81 | 88 | 57 | 82 | 70 | 85 |
| 71 | 51 | 82 | 77 | 79 | 77 |
| 83 | 80 | 54 | 80 | 81 | 73 |
| 59 | 84 | 75 | 76 | 68 | 78 |
| 83 | 78 | 55 | 67 | 85 | 79 |

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

**Find the percent of the number.** *(Section 4.1)*

**14.** 25% of 180       **15.** 30% of 90       **16.** 16% of 140       **17.** 64% of 80

**18. MULTIPLE CHOICE** Two rectangles are similar. The smaller rectangle has a length of 8 feet. The larger rectangle has a length of 14 feet. What is the ratio of the area of the smaller rectangle to the area of the larger rectangle? *(Section 5.3)*

Ⓐ 7 : 4       Ⓑ 4 : 7       Ⓒ 9 : 16       Ⓓ 16 : 49