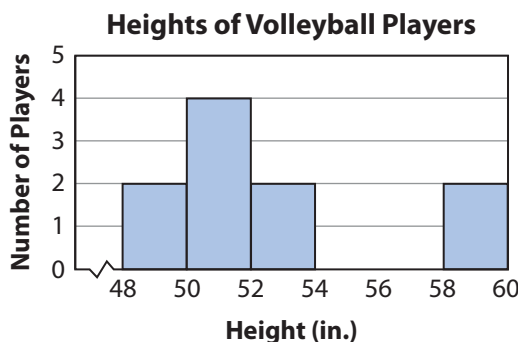


## Dear Family,

This week your student is learning how to use dot plots and histograms to describe data distributions.

A **histogram** displays the frequency of data in equal-size intervals of the number line. This histogram shows 4 players whose heights are from 50 in. up to, but not including, 52 in. A player whose height is 52 in. would instead be counted in the next interval.

Your student will be learning how to solve problems like the one below.



The list shows the heights, in inches, of 13 soccer players. Display and describe the distribution of the data.

65, 63, 64, 59, 66, 65, 64, 66, 66, 64, 63, 65, 66

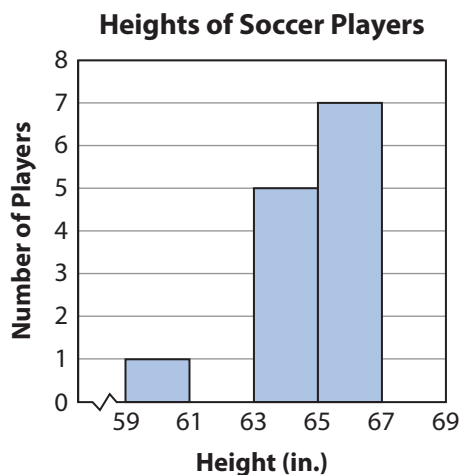
▶ **ONE WAY** to display a data distribution is with a frequency table.

Height (in.)	Frequency
59–60	
61–62	
63–64	
65–66	

No player is 61 in. or 62 in. tall. This is a **gap** in the data. Most of the data are in a **cluster** near the higher values. There is a **peak** at 65 in. to 66 in.

Both displays can be used to describe the shape of the data distribution.

▶ **ANOTHER WAY** is to use a histogram.



When data are clustered near higher values, the distribution is **skewed left**.



Use the next page to start a conversation about data displays.

## Activity Exploring Dot Plots and Histograms

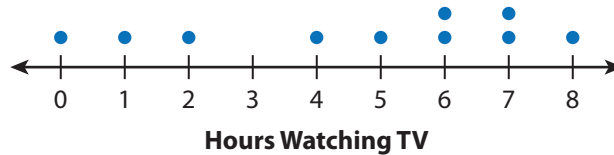
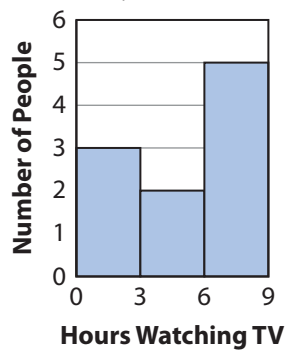
- Do this activity together to look for relationships between dot plots and histograms.

Dot plots and histograms can be used to display numerical data. There are two sets of dot plots and histograms below. The two graphs in each set represent the same data. What do you notice about each set?



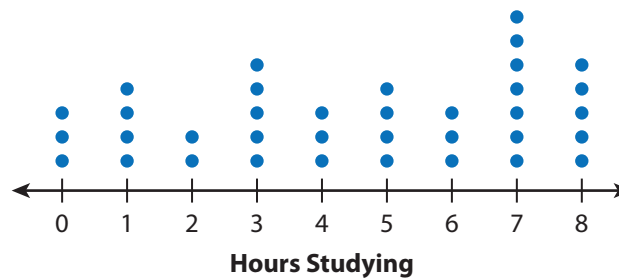
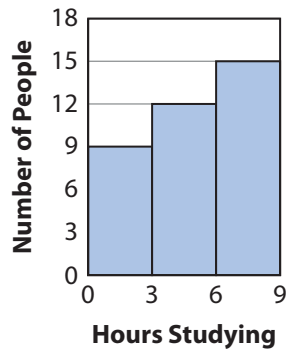
### SET 1

Weekly TV Watching



### SET 2

Weekly Studying



How can you use each dot plot to make a histogram with a larger or smaller interval?

# Explore Dot Plots and Histograms

Previously, you learned about statistical questions and data distributions. In this lesson, you will learn about displaying and describing data distributions with dot plots and histograms.

► Use what you know to try to solve the problem below.

The parks department can add one new program to its summer camp. The data show the ages of children who have signed up. Based on **Data Set: Ages in Years**, which age group should get the new program?

Ages in Years				
10	6	8	8	14
10	9	7	11	10

See page DS1 for the complete data set.

**PARKS DEPARTMENT**  
**SUMMER CAMP**  
 Programs for all ages

*Join us for a summer packed with fun and exciting activities!*

**AGE GROUPS**

3-5

6-8

9-11

12-14

15-17

**TRY IT**



**Math Toolkit** connecting cubes, counters, graph paper, sticky notes, unit tiles

**DISCUSS IT**

**Ask:** How does your model show the age groups?

**Share:** In my model, I showed the age groups by . . .



**Learning Targets** SMP 1, SMP 2, SMP 3, SMP 4, SMP 5, SMP 6, SMP 7

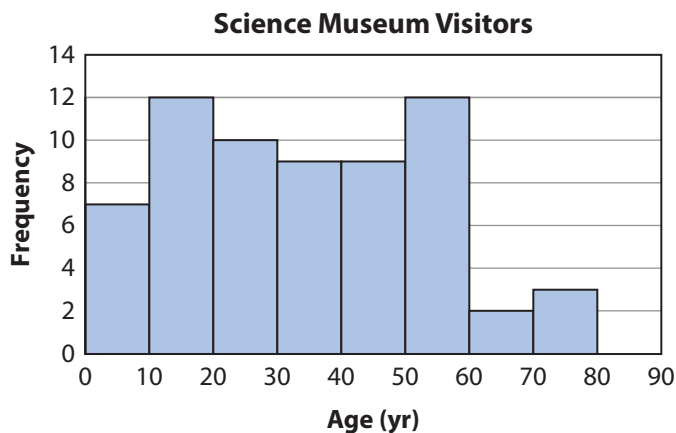
- Understand that a distribution can be described by its center, spread, and overall shape.
- Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
- Summarize numerical data sets in relation to their context by describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

## CONNECT IT

1 **Look Back** Which age group of children should get the new program from the parks department? Explain how you know.

2 **Look Ahead** When working with large data sets, it is sometimes helpful to show the frequencies of groups of data values instead of individual values. A **histogram** organizes data values into equal-size intervals of the number line. A bar is used to show how many data values are in each interval.

a. This histogram shows the distribution of ages of visitors at a science museum at noon on one day. The first bar represents visitors in the age group 0–9, the second bar represents visitors in the age group 10–19, and so on. How many visitors are in the age group 0–9? How do you know?



b. Two visitors at the museum are 70 years old. Which bar includes these visitors?

c. Can you use the histogram to tell how many visitors are 13 years old? Explain.

d. The size of the age interval for each bar is the number of years included in the interval. What is the size of the age intervals in the histogram?

3 **Reflect** Suppose you make the interval size in the histogram twice as large. How would this change affect the histogram?

# Prepare for Using Dot Plots and Histograms to Describe Data Distributions

- 1 Think about what you know about data distributions. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

**In My Own Words**

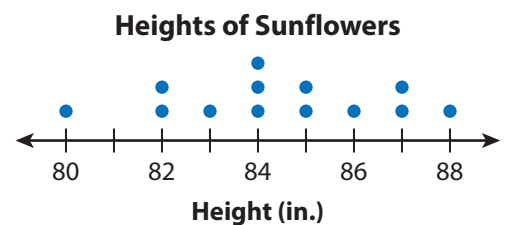
**My Illustrations**

**distribution**

**Examples**

**Non-Examples**

- 2 How does the dot plot show the distribution of sunflower heights?



- 3 A person's hat size is based on the distance around the person's head. The data show this distance, in centimeters, of the last 50 customers who bought hats in a hat store.

Distance Around (cm)									
58	61	55	60	54	59	55	57	56	56
58	56	57	57	57	54	58	54	58	55
59	55	58	54	61	56	58	57	59	54
59	57	60	55	59	55	57	57	56	55
58	61	58	58	57	59	55	57	58	58



Distance Around (cm)	Hat Size
54–55	small
56–57	medium
58–59	large
60–61	extra large

- a. Based on this data set, which size hat should the store stock in the greatest number? Show your work.

### SOLUTION

- b. Check your answer to problem 3a. Show your work.

# Develop Displaying Data with a Histogram

► Read and try to solve the problem below.

Elizabeth records the number of points her favorite basketball team scores in each game. She predicts that the team will score about 120 points in its next game. Is Elizabeth’s prediction reasonable? Display **Data Set: Points Scored** in a way that supports your answer.



**TRY IT**



**Math Toolkit** graph paper, number lines, sticky notes

**DISCUSS IT**

**Ask:** How did you get started?

**Share:** I started by ...

► Explore different ways to represent a data distribution.

Elizabeth records the number of points her favorite basketball team scores in each game. She predicts that the team will score about 120 points in its next game. Is Elizabeth’s prediction reasonable? Display **Data Set: Points Scored** in a way that supports your answer.

Points Scored	
Date	Points
Oct. 16	81
Oct. 19	88

See page DS2 for the complete data set.

**Model It**

You can use a frequency table to organize the data values into equal-size intervals.

The least value in the data set is 81 points and the greatest value is 141 points. The intervals need to include values from **81** to **141**.

You can group the data into 10-point intervals starting from **80**. The last interval ends at **149**.

The tally marks show how many data values are in each interval.

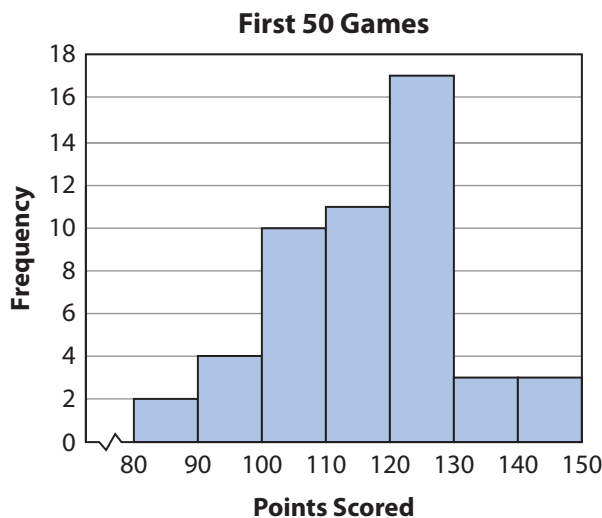


Points Scored	Frequency
80–89	
90–99	
100–109	
110–119	
120–129	
130–139	
140–149	

**Model It**

You can use a histogram to display the data distribution.

The histogram shows the frequency of the data values using an interval size of 10.





## CONNECT IT

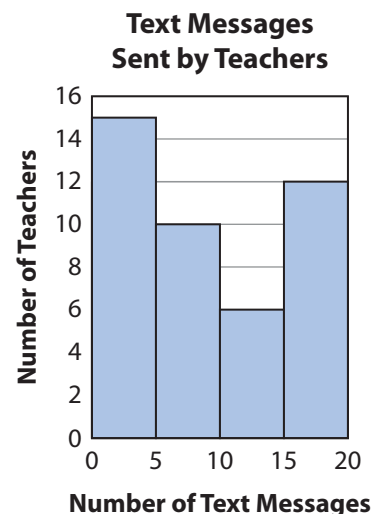
► Use the problem from the previous page to help you understand how to display data with a histogram.

- 1 Look at the first **Model It**. What do the 4 tally marks for interval 90–99 mean?
- 2 Look at the second **Model It**. How is interval 90–99 shown in the histogram? How does this show the same information as the frequency table?
- 3 What challenges might Elizabeth face if she tries to display the data in a dot plot?
- 4 How is a histogram similar to a dot plot? How is it different?
- 5 Is Elizabeth's prediction reasonable? Explain how the histogram can help you analyze Elizabeth's prediction.
- 6 When is it helpful to use a histogram to organize and display data?
- 7 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to solve the **Try It** problem.

## Apply It

► Use what you learned to solve these problems.

8 Oliver wonders how much his teachers use text messages to communicate. He asks each teacher at his school how many text messages they sent yesterday. The histogram shows his data.

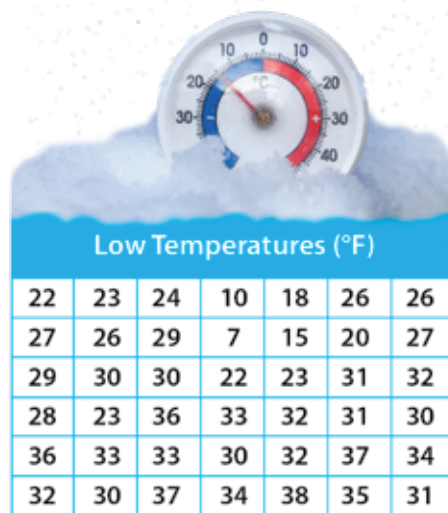
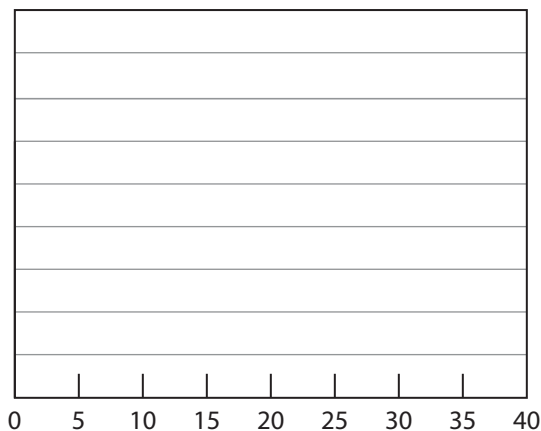


a. What could have been the least number of text messages sent?

b. Explain why it is helpful to see this distribution in a histogram.

c. When Oliver collects his data, he has the teachers count each sent text message as 1 text. He notices that some teachers send several short text messages, while other teachers send one long text message. What change could Oliver make to the way he collects the data to address this issue?

9 Eldora records the low temperature in her town each day for 6 weeks. Make a histogram to display Eldora's data.



## Practice Displaying Data with a Histogram

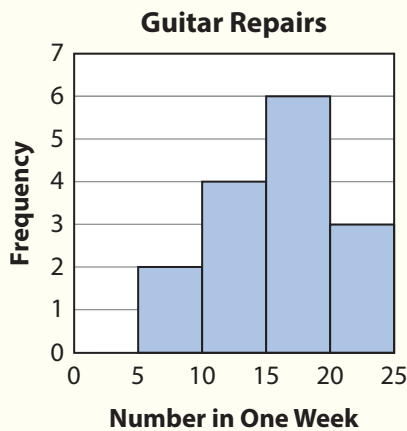
- Study the Example showing how to display data with a histogram. Then solve problems 1–3.

### Example

The frequency table shows data on the number of guitars a music shop repairs in a week. Display the data in a histogram.

Use the frequency of each interval as the height of the corresponding bar.

Number of Repairs	Frequency
0–4	
5–9	
10–14	
15–19	
20–24	



- a. How many weeks did the shop in the Example repair at least 15 guitars?

b. What information would a dot plot show that the histogram and frequency table do not show?
- Shanika uses the data from the Example to make a histogram with an interval size of 10. How will this change the shape of the histogram?

### Vocabulary

#### histogram

a data display similar to a bar graph. A histogram groups the data into equal-size intervals. The height of each bar represents the number of data points in that group.



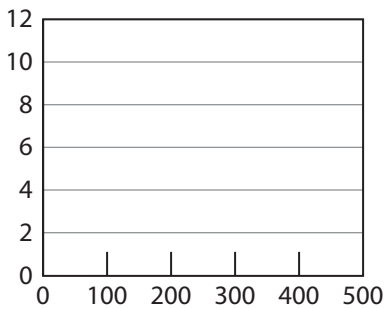
Calories per Serving				
15	56	102	43	223
166	124	72	7	344
105	65	203	104	50
259	112	79	358	48
132	31	14	227	188

3 Alyssa completes a science project about using Calories to measure the energy found in food. She collects data on the number of Calories per serving for each of the items in her refrigerator.

a. Complete the frequency table for Alyssa’s data.

Calories per Serving	Frequency
0–99	
100–199	
200–299	
300–399	

b. Make a histogram to represent Alyssa’s data.



c. Describe the shape of the data distribution and what it means in terms of numbers of Calories.

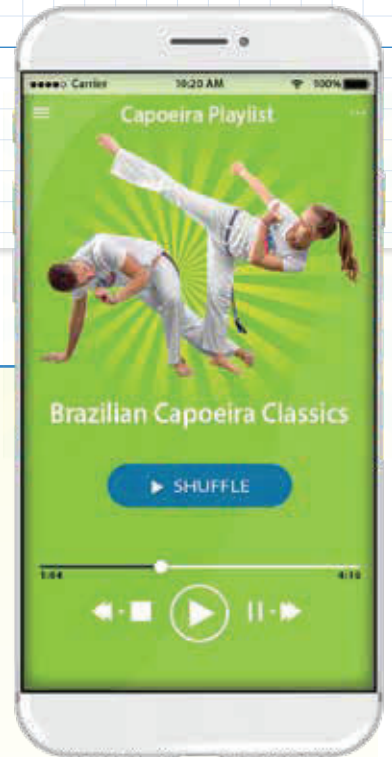
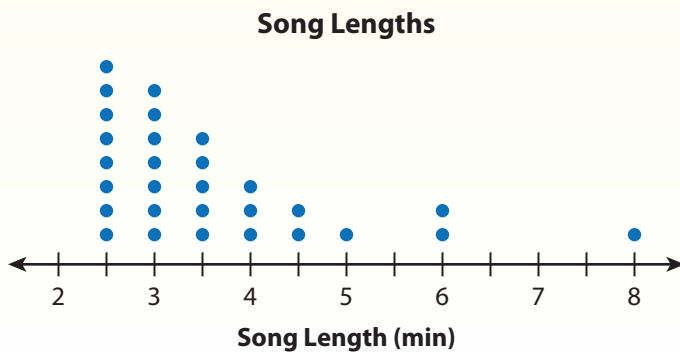
d. How do the frequency table and histogram show the number of items in Alyssa’s refrigerator?

e. Alyssa decides to collect the same information for the school cafeteria refrigerator. There are 250 items in the cafeteria refrigerator. Should Alyssa use a histogram or a dot plot to represent her data? Explain your choice.

# Develop Using Dot Plots and Histograms to Describe Data Distributions

► Read and try to solve the problem below.

Francisca organizes her capoeira club’s annual show where club members perform different routines to music. She times each song using a stopwatch, rounds the lengths of the songs to the nearest 0.5 min, and makes a dot plot of the results. Describe the distribution of the data and what it means in terms of song lengths.



**TRY IT**

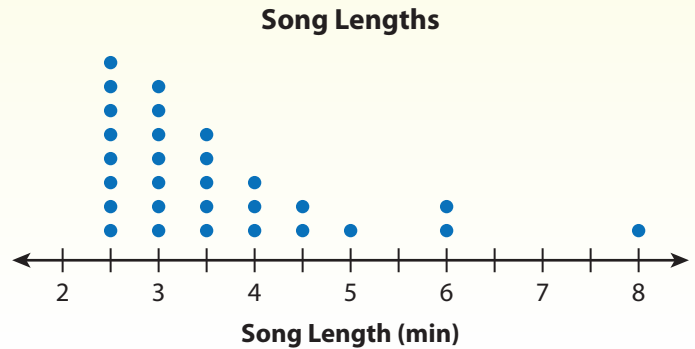
**DISCUSS IT**

**Ask:** What did you notice about the shape of the distribution?

**Share:** I noticed ...

► Explore different ways to describe a data distribution.

Francisca organizes her capoeira club’s annual show where club members perform different routines to music. She times each song using a stopwatch, rounds the lengths of the songs to the nearest 0.5 min, and makes a dot plot of the results. Describe the distribution of the data and what it means in terms of song lengths.



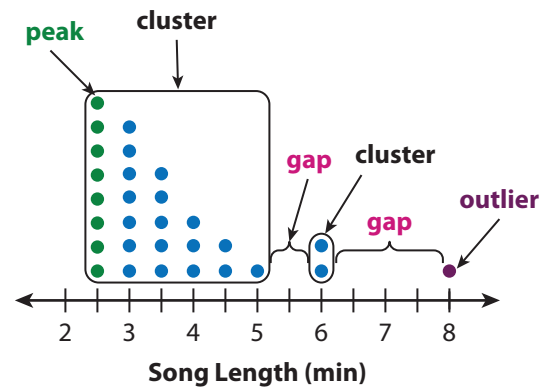
**Analyze It**

You can describe patterns or features of a data distribution.

**Clusters** of data points are separated by **gaps**.

Each cluster may have a **peak**, or high point.

**Outliers** are data values much less or much greater than the other data values.



**Analyze It**

You can describe the general shape of a data distribution.

When most of the data points are near lower values, the distribution is **skewed right**.

When most of the data points are near higher values, the distribution is **skewed left**.

If the middle of the distribution splits the data into two matching halves, the distribution is **symmetric**.



## CONNECT IT

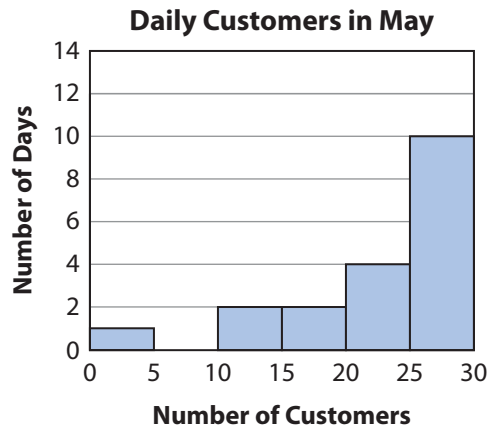
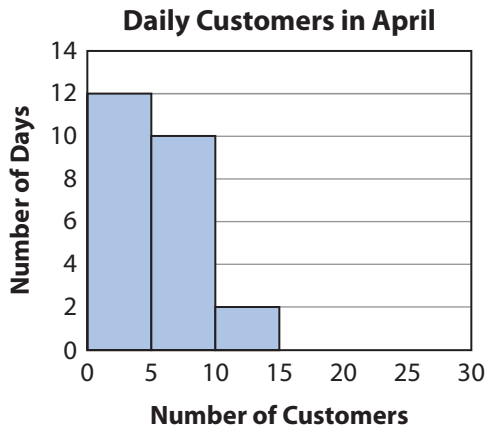
► Use the problem from the previous page to help you understand how to describe data distributions.

- 1 What is another way Francisca can collect and record each song length?
- 2 Look at the first **Analyze It**. Describe the distribution of the song lengths using the terms *cluster*, *gap*, *peak*, and *outlier*. What do these features tell you about the song lengths?
- 3 What effect does an outlier have on the range of a data distribution?
- 4 Look at the second **Analyze It**. Is the distribution of Francisca's song lengths *skewed right*, *skewed left*, or *symmetric*? What does this tell you about the data?
- 5 Why can it be helpful to describe features such as peaks, gaps, and skew of a distribution?
- 6 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to describe data distributions.

## Apply It

► Use what you learned to solve these problems.

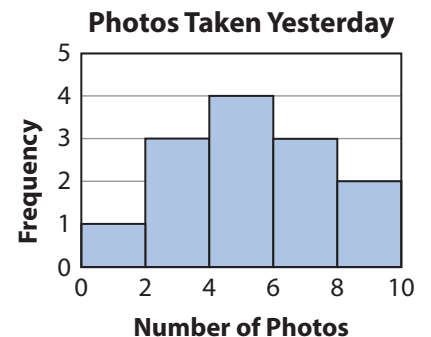
7 Each histogram shows the numbers of daily customers at a kayak shop.



a. Describe the distributions using the terms *clusters*, *gaps*, *peaks*, and *outliers*. What do these values tell you about the data?

b. Describe the skew of the histograms. What can you conclude about the number of customers in April compared to May?

8 Tara collects data about how many photos her classmates took yesterday and displays the data in a histogram. Describe the shape of the distribution shown in the histogram.



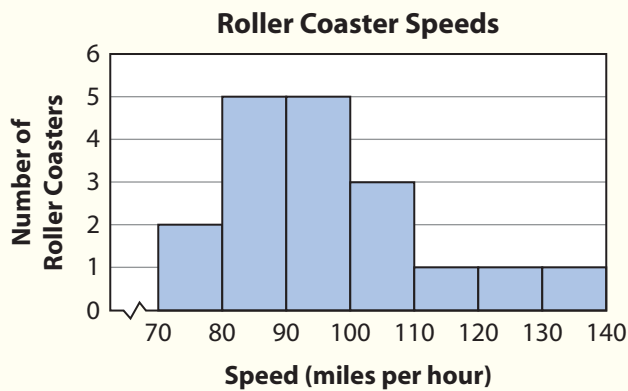


# Practice Using Dot Plots and Histograms to Describe Data Distributions

- Study the Example showing how to describe a data distribution using a histogram. Then solve problems 1–2.

## Example

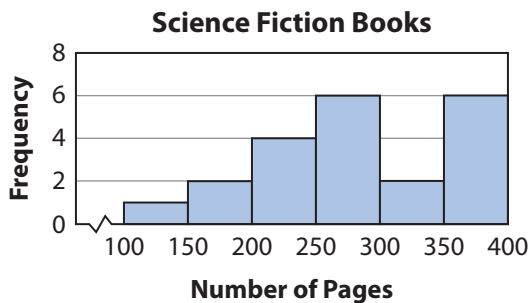
The histogram shows the top speeds of some of the fastest roller coasters in the world. Use the shape of the data distribution to make a conclusion about the top speed of a typical fast roller coaster.



The histogram is skewed right because most of the data points are clustered near lower values. There is a peak from 80 to 99 miles per hour.

A typical fast roller coaster could reach 80 to 99 miles per hour.

- 1 Badru makes a histogram of the data he collects about the number of pages in 21 science fiction books. Describe the shape of the data distribution.



2 Wyatt is thinking about starting to babysit. He wonders how many hours he might expect to be able to babysit. He asks 20 babysitters: *How many hours did you babysit last week?*

a. Draw a dot plot of the data.

Hours Spent Babysitting				
7	0	5	8	3
9	4	1	5	6
6	11	6	0	7
2	8	4	11	6

b. About how many hours does a person typically babysit in a week? Use the shape of the distribution to support your answer.

c. Draw a histogram with the same data.

d. Describe the shape of the data distribution shown in the histogram. How does this compare to how the data are distributed in the dot plot?

# Refine Using Dot Plots and Histograms to Describe Data Distributions



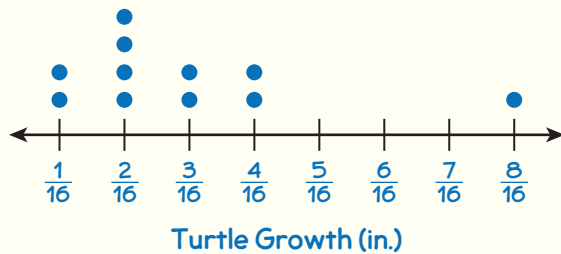
► Complete the Example below. Then solve problems 1–9.

### Example

An aquarium technician records the number of inches a painted turtle grows each month for a year. Describe the distribution of the data.

Monthly Turtle Growth (in.)										
$\frac{1}{16}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{2}$	$\frac{1}{16}$

Look at how you could display this data with a dot plot in order to describe the distribution.



**SOLUTION** \_\_\_\_\_

### CONSIDER THIS . . .

The scale on the number line is based on a common denominator of the fractions.

### PAIR/SHARE

About how much does the turtle grow each month? Justify your reasoning.

## Apply It

1 Is the data distribution symmetric? Use a data display to show your work.

13, 5, 6, 1, 7, 5, 6, 12, 4, 2, 4, 3, 2, 3, 3, 4, 4, 12, 13

**SOLUTION** \_\_\_\_\_

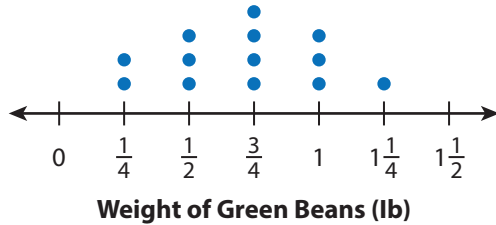
### CONSIDER THIS . . .

In a symmetric graph, the left and right sides are matching.

### PAIR/SHARE

Would a histogram and a dot plot show the same pattern? Explain.

- 2 The dot plot shows the weights of green beans that people buy at a market. The owner wants to sell green beans in pre-packaged bags all with the same weight. What weight should the owner choose for her pre-packaged green beans? Use the dot plot to support your answer.



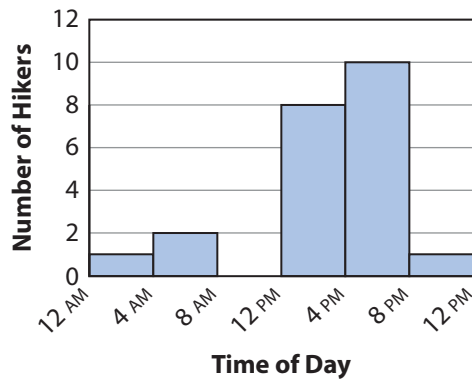
**CONSIDER THIS ...**

How would you describe the distribution of the data?

**PAIR/SHARE**

If someone buys 2 lb of green beans, how would that affect the distribution?

- 3 The histogram shows the number of hikers on a trail at different times of day. Which statement best describes the distribution?



**CONSIDER THIS ...**

Where are most of the data points in the histogram, and what does this tell you about the data?

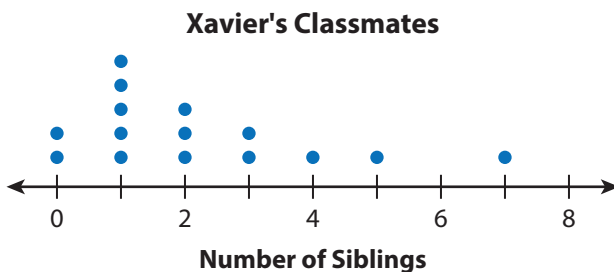
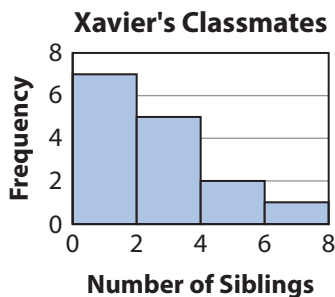
- A The distribution is skewed right.
- B The distribution is skewed left.
- C The distribution is symmetric.
- D The distribution contains an outlier.

Caleb chose D as the correct answer. How might he have gotten that answer?

**PAIR/SHARE**

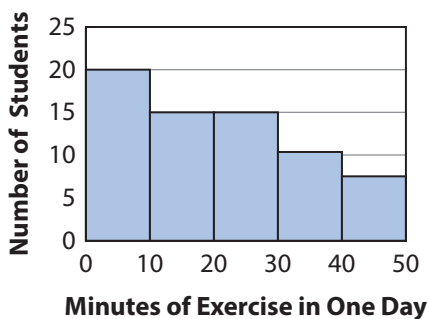
What statistical question could be answered using this histogram?

- 4 The histogram and dot plot show how many siblings Xavier's classmates have. Why could you argue that the dot plot is a better representation of the data?



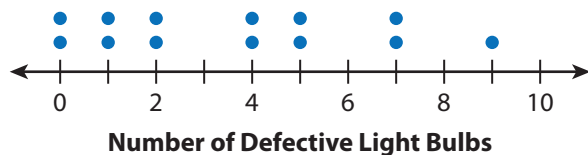
- 5 Is it always possible to find the range of a data set from a dot plot? Is it always possible to find the range from a histogram? Explain.

- 6 Which statements must be true based on the histogram? Select all that apply.



- A The range of the data set is 50 min.
- B The distribution has gaps in it.
- C The most common amount of exercise is 0 to 9 min.
- D Five students exercised for 40 min.
- E The distribution is skewed right.

- 7 A factory manager records the number of defective light bulbs per case in a dot plot. Describe the shape of the distributions and explain what the patterns mean in terms of the data.



- 8 Display the data from problem 7 in a histogram. Which display, the *dot plot* or the *histogram*, do you think the factory manager would choose to use to show the data? Explain your reasoning.

- 9 **Math Journal** Make your own data set to display on a dot plot that is skewed left and has an outlier, a peak, and a gap. Describe the data distribution.

### ✓ End of Lesson Checklist

- INTERACTIVE GLOSSARY** Find the entry for *histogram*. Add two important things you learned about histograms in this lesson.
- SELF CHECK** Go back to the Unit 7 Opener and see what you can check off.