10.3 Shapes of Distributions

Essential Question How can you describe the shape of the distribution of a data set?

1 ACTIVITY: Describing the Shape of a Distribution

Work with a partner. The lists at the left show the last four digits of a set of phone numbers in a phone book.

-7253
-7290
-7200
-1192
-1142

-3500
-2531
-2079
-5897
-5341
-1392
-5406
-7875
-7335
-0494
-9018
-2184
-2367

-8678
-2063
-2911
-2103
-4328
-7826
-7957
-7246
-2119
-7845
-1109
-9154

a. Create a list that represents the last digit of each phone number shown. Make a dot plot of the data.

b. In your own words, how would you describe the shape of the distribution? What single word do you think you can use to identify this type of distribution? Explain your reasoning.

2 ACTIVITY: Describing the Shape of a Distribution

Work with a partner. The lists at the right show the first three digits of a set of phone numbers in a phone book.

538-
438-
664-
761-
868-

735-
694-
599-
725-
556-
555-
456-
736-
664-
576-
664-
664-
725-

664-
664-
538-
855-
664-
538-
654-
654-
725-
538-
799-
764-

a. Create a list that represents the first digit of each phone number shown. Make a dot plot of the data.

b. In your own words, how would you describe the shape of the distribution? What single word do you think you can use to identify this type of distribution? Explain your reasoning.

c. In your dot plot, draw a vertical line through the middle of the data set. What do you notice?

d. Repeat part (c) for the dot plot you constructed in Activity 1. What do you notice? Compare the distributions from Activities 1 and 2.

Data Displays

In this lesson, you will

- describe shapes of distributions.

The Meaning of a Word ● Skewed

When something is **skewed**, it has a slanted direction or position.

3 ACTIVITY: Describing the Shape of a Distribution

Work with a partner. The table shows the ages of cellular phones owned by a group of students.

a. Make a dot plot of the data.

b. In your own words, how would you describe the shape of the distribution? Compare it to the distributions in Activities 1 and 2.

c. Why do you think this type of distribution is called a *skewed distribution*?

Ages of Cellular Phones (years)				
0	1	0	6	4
2	3	5	1	1
0	1	2	3	1
0	0	1	1	1
7	1	4	2	2
0	2	0	1	2

4 ACTIVITY: Finding Measures of Center

Work with a partner.

a. Find the means and the medians of the data sets in Activities 1–3.

b. What do you notice about the means and the medians of the data sets and the shapes of the distributions? Explain.

c. Which measure of center do you think best describes the data set in Activity 2? in Activity 3? Explain your reasoning.

d. Using your answers to part (c), decide which measure of variation you think best describes the data set in Activity 2. Which measure of variation do you think best describes the data set in Activity 3? Explain your reasoning.

Math Practice

Use Prior Results

How is the distribution of the data related to the mean and the median?

What Is Your Answer?

5. **IN YOUR OWN WORDS** How can you describe the shape of the distribution of a data set?

6. Name two other ways you can describe the distribution of a data set.

Practice Use what you learned about shapes of distributions to complete Exercises 3 and 4 on page 454.

10.3 Lesson

Check It Out
Lesson Tutorials
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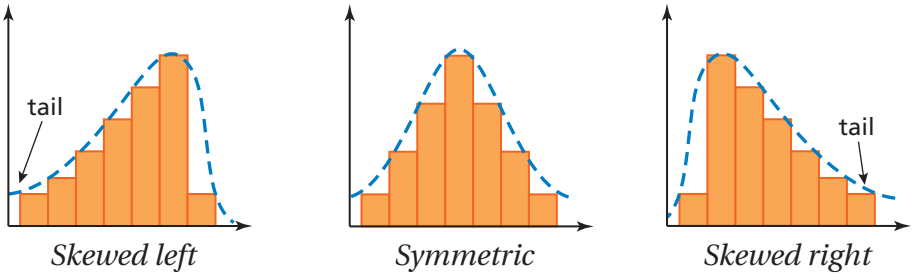
You can use dot plots and histograms to identify shapes of distributions.

Key Ideas

Symmetric and Skewed Distributions



Skewed left

- The "tail" of the graph extends to the left.
- Most data are on the right.

Symmetric

- The left side of the graph is a mirror image of the right side of the graph.

Skewed right

- The "tail" of the graph extends to the right.
- Most data are on the left.

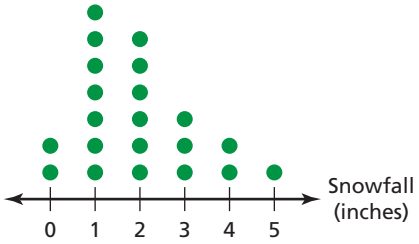
Study Tip

If all the dots of a dot plot or bars of a histogram are about the same height, then the distribution is a *flat*, or *uniform*, distribution. A uniform distribution is also symmetric.

EXAMPLE 1 Describing the Shapes of Distributions

Describe the shape of each distribution.

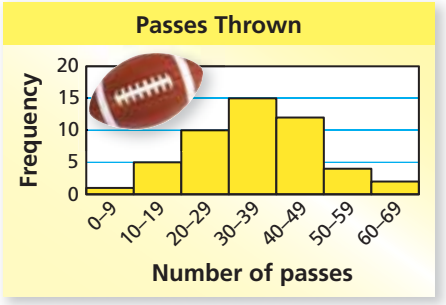
a. Daily Snowfall Amounts



Most of the data are on the left, and the tail extends to the right.

So, the distribution is skewed right.

b.



The left side of the graph is approximately a mirror image of the right side of the graph.

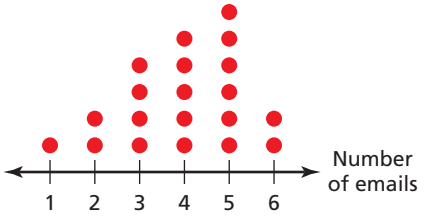
So, the distribution is symmetric.

On Your Own

Now You're Ready
Exercises 5–8

1. Describe the shape of the distribution.

Daily Spam Emails Received



EXAMPLE 2 Describing the Shape of a Distribution

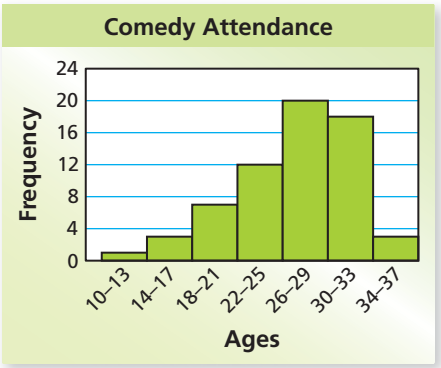
Ages	Frequency
10–13	1
14–17	3
18–21	7
22–25	12
26–29	20
30–33	18
34–37	3

The frequency table shows the ages of people watching a comedy in a theater. Display the data in a histogram. Describe the shape of the distribution.

Draw and label the axes. Then draw a bar to represent the frequency of each interval.

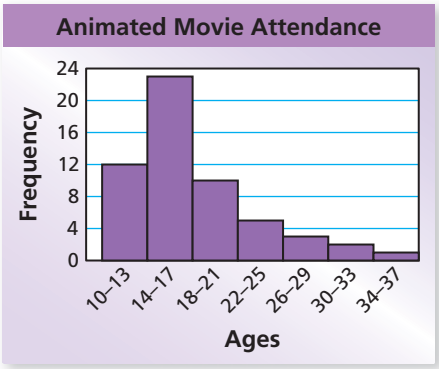
Most of the data are on the right, and the tail extends to the left.

∴ So, the distribution is skewed left.



EXAMPLE 3 Comparing Shapes of Distributions

The histogram shows the ages of people watching an animated movie in the same theater as in Example 2.



a. Describe the shape of the distribution.

Most of the data are on the left, and the tail extends to the right.

∴ So, the distribution is skewed right.

b. Which movie has an older audience?

The intervals in the histograms are the same. Most of the data for the animated movie are on the left, while most of the data for the comedy are on the right. This means that the people watching the comedy are generally older than the people watching the animated movie.

∴ So, the comedy has an older audience.

On Your Own

Now You're Ready
Exercise 9

2. The frequency table shows the ages of people watching a historical movie in a theater.

Ages	10–19	20–29	30–39	40–49	50–59	60–69
Frequency	3	18	36	40	14	5

a. Display the data in a histogram. Describe the shape of the distribution.

b. Compare the distribution of the data to the distributions in Examples 2 and 3. What can you conclude?

10.3 Exercises

Check It Out
Help with Homework
BigIdeasMath.com

Vocabulary and Concept Check

1. **VOCABULARY** How does the shape of a symmetric distribution differ from the shape of a skewed distribution?

2. **VOCABULARY** For a distribution that is skewed right, which direction does the tail extend? Where do most of the data lie?

Practice and Problem Solving

Make a dot plot of the data. In your own words, how would you describe the shape of the distribution?

3.

Miles Run per Day										
1	4	2	0	3	2	1	2	4	2	3
2	1	6	3	2	4	0	5	3	1	5

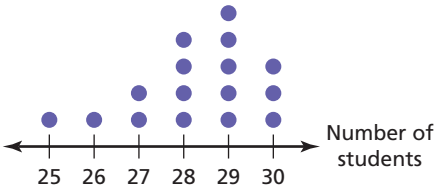
4.

Raffle Tickets Sold							
15	12	16	15	13	14	16	13
13	16	14	12	15	12	14	

Describe the shape of each distribution.

1

5.



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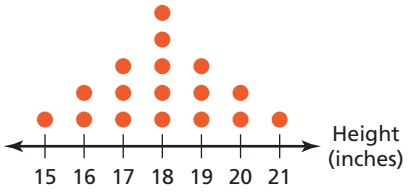

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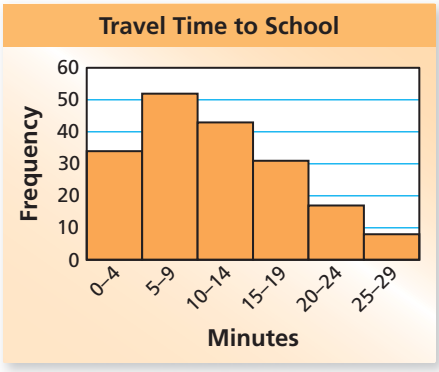

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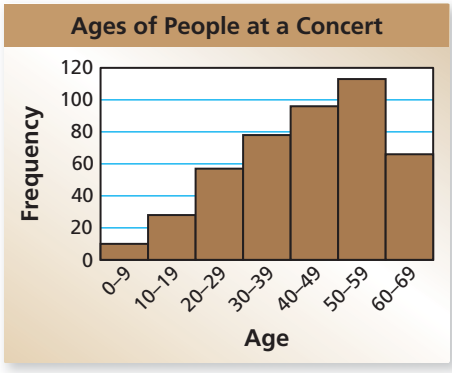
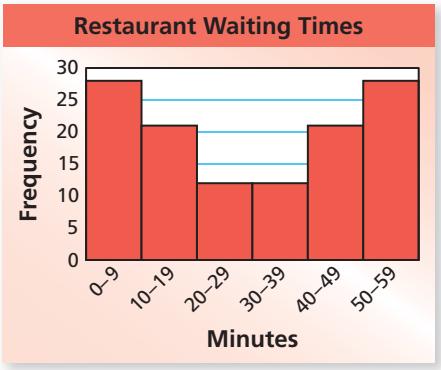


2 3

9. **POLICE** The frequency table shows the years of service for the police officers of Jones County and Pine County. Display the data for each county in a histogram. Describe the shape of each distribution. Which county's police force has less experience? Explain.

Years of Service	0–3	4–7	8–11	12–15	16–19	20–23	24–27
Frequency for Jones County	7	15	17	12	8	5	3
Frequency for Pine County	3	5	9	14	10	6	2

10. REASONING What is the shape of the distribution of the restaurant waiting times? Explain your reasoning.



11. LOGIC Are all distributions either approximately symmetric or skewed? Explain. If not, give an example.

12. REASONING Can you use a stem-and-leaf plot to describe the shape of a distribution? Explain your reasoning.

13. CHARITY The table shows the donation amounts received by a charity in one day.

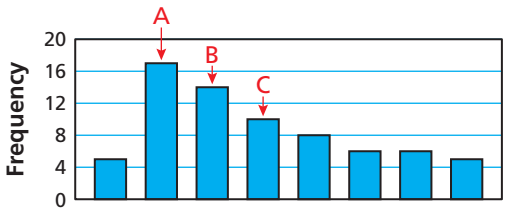
Donations (dollars)												
20	15	40	70	20	5	25	50	47	20	62	55	40
10	50	18	20	100	40	80	60	20	80	3	30	50
25	30	10	33	20	50	7	35	40	25	70		

a. Make a histogram of the data starting with the interval 0–14. Describe the shape of the distribution.

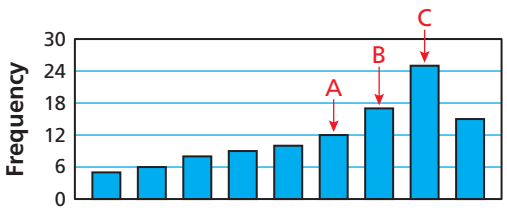
b. A company adds $5 to each donation. Make another histogram starting with the same first interval as in part (a). Compare the shape of this distribution with the distribution in part (a). Explain any differences in the distributions.

14. Critical Thinking Describe the shape of the distribution of each bar graph. Match the letters A, B, and C with the mean, the median, and the mode of the data set. Explain your reasoning.

a.



b.



Fair Game Review What you learned in previous grades & lessons

Find the median, first quartile, third quartile, and interquartile range of the data. *(Section 9.4)*

15. 68, 74, 67, 72, 63, 70, 78, 64, 76

16. 39, 48, 33, 24, 30, 44, 36, 41, 28, 53

17. MULTIPLE CHOICE Sixty people participate in a trivia contest. How many four-person teams can be formed? *(Section 7.3)*

(A) 15 (B) 56 (C) 64 (D) 240