

Stem-and-Leaf Plots



MAIN IDEA

Display and analyze data in a stem-and-leaf plot.

New Vocabulary

stem-and-leaf plot
leaf
stem

Math Online

glencoe.com

- Extra Examples
- Personal Tutor
- Self-Check Quiz

▶ GET READY for the Lesson

BIRDS The table shows the average chick weight in grams of sixteen different species of birds.

1. Which chick weight is the lightest?
2. How many of the weights are less than 10 grams?

| Chick Weight (g) | | | |
|------------------|----|----|----|
| 19 | 6 | 7 | 10 |
| 11 | 13 | 18 | 25 |
| 21 | 12 | 5 | 12 |
| 20 | 21 | 11 | 12 |

In a **stem-and-leaf plot**, the data are organized from least to greatest. The digits of the least place value usually form the **leaves**, and the next place-value digits form the **stems**.

EXAMPLE Display Data in a Stem-and-Leaf Plot

1 BIRDS Display the data in the table above in a stem-and-leaf plot.

Step 1 Choose the stems using digits in the tens place, 0, 1, and 2. The least value, 5, has 0 in the tens place. The greatest value, 25, has 2 in the tens place.

Step 2 List the stems from least to greatest in the *Stem* column. Write the leaves, the ones digits to the right of the corresponding stems.

| Stem | Leaf |
|------|-------------------|
| 0 | 6 7 5 |
| 1 | 9 0 1 3 8 2 2 1 2 |
| 2 | 5 1 0 1 |

Step 3 Order the leaves and write a *key* that explains how to read the stems and leaves. Include a title.

Chick Weight (g)

| Stem | Leaf |
|------|-------------------|
| 0 | 5 6 7 |
| 1 | 0 1 1 2 2 2 3 8 9 |
| 2 | 0 1 1 5 |

$1|2 = 12\text{ g}$

The tens digits of the data form the stems.

Always write each leaf, even if it repeats.

The ones digits of the data form the leaves.

Include a key.

✓ CHECK Your Progress

a. **HOMEWORK** The number of minutes the students in Mr. Blackwell's class spent doing their homework one night is shown. Display the data in a stem-and-leaf plot.

| Homework Time (min) | | | | |
|---------------------|----|----|----|----|
| 42 | 5 | 75 | 30 | 45 |
| 47 | 0 | 24 | 45 | 51 |
| 56 | 23 | 39 | 30 | 49 |
| 58 | 55 | 75 | 45 | 35 |

Stem-and-leaf plots are useful in analyzing data because you can see all the data values, including the greatest, least, mode, and median value.

EXAMPLE Describe Data

2 **CHES** The stem-and-leaf plot shows the number of chess matches won by members of the Avery Middle School Chess Team. Find the range, median, and mode of the data.

range: greatest wins – least wins
= 61 – 8 or 53

median: middle value, or 35 wins

mode: most frequent value, 40

| Chess Matches Won | |
|-------------------|-----------------------|
| Stem | Leaf |
| 0 | 8 8 9 |
| 1 | 9 |
| 2 | 0 0 2 4 4 8 9 |
| 3 | 1 1 2 4 5 5 6 6 7 7 8 |
| 4 | 0 0 0 3 8 9 |
| 5 | 2 4 |
| 6 | 1 |

$3|2 = 32 \text{ wins}$

CHECK Your Progress

b. **BIRDS** Find the range, median, and mode of the data in Example 1.



Real-World Career . . .

How Does a Sports Scout Use Math?

Sports scouts review game records and statistics and evaluate athletes' skills.

Math Online

For more information, go to glencoe.com.

EXAMPLE Effect of Outliers

3 **SPORTS** The stem-and-leaf plot shows the number of points scored by a college basketball player. Which measure of central tendency is most affected by the outlier?

The mode, 26, is not affected by the inclusion of the outlier, 2.

Calculate the mean and median each without the outlier, 2.

Then calculate them including the outlier and compare.

| | without the outlier | including the outlier |
|---------|---|---|
| mean: | $\frac{12 + 12 + \dots + 31}{19} \approx 22.37$ | $\frac{2 + 12 + 12 + \dots + 31}{20} = 21.35$ |
| median: | 23 | 22 |

The mean decreased by $22.37 - 21.35$, or 1.02, while the median decreased by $23 - 22$, or 1. Since $1.02 > 1$, the mean is most affected.

CHECK Your Progress

c. **CHES** Refer to Example 2. If an additional student had 84 wins, which measure of central tendency would be most affected?

CHECK Your Understanding

Example 1 Display each set of data in a stem-and-leaf plot.
(p. 410)

1.

| Height of Trees (ft) | | | | |
|----------------------|----|----|----|----|
| 15 | 25 | 8 | 12 | 20 |
| 10 | 16 | 15 | 8 | 18 |

2.

| Cost of Shoes (\$) | | | | |
|--------------------|----|----|----|----|
| 42 | 47 | 19 | 16 | 21 |
| 23 | 25 | 25 | 29 | 31 |
| 33 | 34 | 35 | 39 | 48 |

Examples 2, 3 **CAMP** The stem-and-leaf plot at the right shows the ages of students in a pottery class.
(p. 411)

| Ages of Students | |
|------------------|---------------------|
| Stem | Leaf |
| 0 | 9 9 9 |
| 1 | 0 1 1 1 1 2 2 3 3 4 |

1|0 = 10 years

- What is the range of the ages of the students?
- Find the median and mode of the data.
- If an additional student was 6 years old, which measure of central tendency would be most affected?

Practice and Problem Solving

HOMEWORK HELP

| For Exercises | See Examples |
|-----------------------|--------------|
| 6–9 | 1 |
| 10, 11, 13, 14, 16–18 | 2 |
| 12, 15, 19 | 3 |

Display each set of data in a stem-and-leaf plot.

6.

| Quiz Scores (%) | | | |
|-----------------|----|----|----|
| 70 | 96 | 72 | 91 |
| 80 | 80 | 79 | 93 |
| 76 | 95 | 73 | 93 |
| 90 | 93 | 77 | 91 |

7.

| Low Temperatures (°F) | | | | |
|-----------------------|----|----|----|----|
| 15 | 13 | 28 | 32 | 38 |
| 30 | 31 | 13 | 36 | 35 |
| 38 | 32 | 38 | 24 | 20 |

8.

| Floats at Annual Parade | | | |
|-------------------------|-----|-----|-----|
| 151 | 158 | 139 | 103 |
| 111 | 134 | 133 | 154 |
| 157 | 142 | 149 | 159 |

9.

| School Play Attendance | | | |
|------------------------|-----|-----|-----|
| 225 | 227 | 230 | 229 |
| 246 | 243 | 269 | 269 |
| 267 | 278 | 278 | 278 |

CYCLING The number of Tour de France titles won by eleven countries is shown.

Tour de France Titles Won by Eleven Countries

| Stem | Leaf |
|------|-------------------------|
| 0 | 1 1 1 2 2 4 8 9 |
| 1 | 0 8 |
| 2 | |
| 3 | 6 <i>0 4 = 4 titles</i> |

- Find the range of titles won.
- Find the median and mode of the data.
- Which measure of central tendency is most affected by the outlier?

ELECTRONICS For Exercises 13–15, use the stem-and-leaf plot that shows the costs of various DVD players at an electronics store.

Costs of DVD Players

| Stem | Leaf |
|------|---------------|
| 8 | 2 5 5 |
| 9 | 9 9 |
| 10 | 0 0 2 5 6 8 |
| 11 | 0 0 5 5 5 9 9 |
| 12 | 5 7 7 |

11|5 = \$115

- What is the range of the prices?
- Find the median and mode of the data.
- If an additional DVD player cost \$153, which measure of central tendency would be most affected?



Real-World Link
 The saltwater crocodile is the largest living reptile. Some measuring 27–30 feet in length have been recorded in the wild.
 Source: PBS

HISTORY For Exercises 16–19, refer to the stem-and-leaf plot below.

Ages of Signers of Declaration of Independence

| Stem | Leaf |
|------|---------------------------------------|
| 2 | 6 6 9 |
| 3 | 0 1 3 3 3 4 4 5 5 5 5 7 7 8 8 9 9 |
| 4 | 0 1 1 1 2 2 2 4 5 5 5 5 6 6 6 6 7 8 9 |
| 5 | 0 0 0 0 2 2 3 3 5 7 |
| 6 | 0 0 2 3 5 6 |
| 7 | 0 |

$3|1 = 31$ years

- How many people signed the Declaration of Independence?
- What was the age of the youngest signer?
- What is the range of the ages of the signers?
- Based on the data, can you conclude that the majority of the signers were 30–49 years old? Explain your reasoning.

20. **GYMNASTICS** The scores for 10 girls in a gymnastics event are 9.3, 10.0, 9.9, 8.9, 8.7, 9.0, 8.7, 8.5, 8.8, 9.3. Analyze a stem-and-leaf plot of the data to draw two conclusions about the scores.

21. **REPTILES** The average lengths of certain species of crocodiles are given in the table. Analyze a stem-and-leaf plot of this data to write a convincing argument about a reasonable length for a crocodile.

| Crocodile Average Lengths (ft) | | | |
|--------------------------------|------|------|------|
| 8.1 | 16.3 | 16.3 | 9.8 |
| 16.3 | 16.3 | 11.4 | 6.3 |
| 13.6 | 9.8 | 19.5 | 16.0 |

Source: Crocodylian Species List

EXTRA PRACTICE
 See pages 688, 711.

22. **FIND THE DATA** Refer to the Data File on pages 16–19. Choose some data that can be presented in a stem-and-leaf plot. Then analyze the stem-and-leaf plot to draw two conclusions about the data.

H.O.T. Problems

23. **FIND THE ERROR** Rosita and Diana are analyzing the data in the stem-and-leaf plot at the right. Diana says half of the pieces of ribbon are between 20 and 30 inches in length. Rosita says there are no pieces of ribbon more than 50 inches in length. Who is correct? Explain.

Cut Ribbon Length

| Stem | Leaf |
|------|-------|
| 2 | 6 6 9 |
| 3 | |
| 4 | 6 |
| 5 | 3 6 |

$2|6 = 26$ in.

24. **CHALLENGE** Create a stem-and-leaf plot in which the median of the data is 25.

25. **WRITING IN MATH** Present the data shown at the right in a line plot and a stem-and-leaf plot. Describe the similarities and differences among the representations. Which representation do you prefer to use? Explain your reasoning.

| Fiber in Cereal (g) | | | | |
|---------------------|---|---|---|---|
| 5 | 5 | 4 | 3 | 3 |
| 3 | 1 | 1 | 1 | 2 |
| 1 | 1 | 1 | 1 | 0 |

26. **COLLECT THE DATA** Collect a set of data that represents the heights in inches of the people in your math class. Then write a question that can be solved by analyzing a stem-and-leaf plot of the data. Be sure to explain how the stem-and-leaf plot would be used to solve your problem.



TEST PRACTICE

27. Denzell's science quiz scores are 11, 12, 13, 21, and 35. Which stem-and-leaf plot best represents this data?

A

| Stem | Leaf |
|------|------|
| 1 | 1 |
| 2 | 1 |
| 3 | 5 |

$3|5 = 35$

B

| Stem | Leaf |
|------|------|
| 1 | 3 |
| 2 | 1 |
| 3 | 5 |

$3|5 = 35$

C

| Stem | Leaf |
|------|-------|
| 1 | 1 2 3 |
| 2 | 1 |
| 3 | 5 |

$3|5 = 35$

D

| Stem | Leaf |
|------|------|
| 1 | 1 |
| 2 | 1 1 |
| 3 | 5 |

$3|5 = 35$

28. The stem-and-leaf plot shows the points scored by the Harding Middle School basketball team.

Points Scored

| Stem | Leaf |
|------|-------------|
| 4 | 7 8 8 8 |
| 5 | 0 0 2 3 7 9 |
| 6 | 1 6 |
| 7 | |
| 8 | 4 |

$7|0 = 70$

Which one of the following statements is true concerning how the measures of central tendency are affected by the inclusion of the outlier?

- F The mode is most affected.
 G The median is not affected.
 H The mean is most affected.
 J None of the measures of central tendency are affected.

Spiral Review

Find the mean, median, and mode for each set of data. Round to the nearest tenth if necessary. (Lesson 8-2)

29. 80, 23, 55, 58, 45, 32, 40, 55, 50 30. 3.6, 2.4, 3.0, 7.9, 7.8, 2.4, 3.6, 3.9
31. Make a line plot of the test scores shown. (Lesson 8-1)

32. **SCHOOL** The ratio of boys to girls in the sixth grade is 7 to 8. How many girls are in the sixth grade if there are 56 boys? (Lesson 6-1)

33. Write $\frac{9}{24}$ in simplest form. (Lesson 4-4)

| Test Scores | | | | |
|-------------|----|----|----|----|
| 83 | 94 | 78 | 78 | 85 |
| 86 | 88 | 83 | 82 | 92 |
| 90 | 77 | 83 | 81 | 89 |
| 90 | 88 | 87 | 88 | 85 |
| 84 | 81 | 83 | 85 | 91 |

▶ GET READY for the Next Lesson

PREREQUISITE SKILL Choose an appropriate interval and scale for each set of data. (Lesson 8-1)

34. 9, 0, 18, 19, 2, 9, 8, 13, 4 35. 30, 20, 60, 80, 90, 120, 40