Consumable Workbooks

Many of the worksheets contained in the Chapter Resource Masters booklets are available as consumable workbooks in both English and Spanish.

- Study Guide and Intervention Workbook 0-07-860085-5
- Study Guide and Intervention Workbook (Spanish) 0-07-860091-X
- Practice: Skills Workbook 0-07-860086-3
- Practice: Skills Workbook (Spanish) 0-07-860092-8
- Practice: Word Problems Workbook 0-07-860087-1
- Practice: Word Problems Workbook (Spanish) 0-07-860093-6
- Reading to Learn Mathematics Workbook 0-07-861057-5

Answers for Workbooks  The answers for Chapter 2 of these workbooks can be found in the back of this Chapter Resource Masters booklet.

Spanish Assessment Masters  Spanish versions of forms 2A and 2C of the Chapter 2 Test are available in the Glencoe Mathematics: Applications and Concepts Spanish Assessment Masters, Course 1 (0-07-860095-2).
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Teacher’s Guide to Using the
Chapter 2 Resource Masters

The Fast File Chapter Resource system allows you to conveniently file the resources you use most often. The Chapter 2 Resource Masters includes the core materials needed for Chapter 2. These materials include worksheets, extensions, and assessment options. The answers for these pages appear at the back of this booklet.

All of the materials found in this booklet are included for viewing and printing in the Glencoe Mathematics: Applications and Concepts, Course 1, TeacherWorks CD-ROM.

Vocabulary Builder  Pages vii-viii include a student study tool that presents up to twenty of the key vocabulary terms from the chapter. Students are to record definitions and/or examples for each term. You may suggest that students highlight or star the terms with which they are not familiar.

When to Use  Give these pages to students before beginning Lesson 2-1. Encourage them to add these pages to their mathematics study notebook. Remind them to add definitions and examples as they complete each lesson.

Family Letter and Family Activity  Page ix is a letter to inform your students’ families of the requirements of the chapter. The family activity on page x helps them understand how the mathematics students are learning is applicable to real life.

When to Use  Give these pages to students to take home before beginning the chapter.

Study Guide and Intervention  There is one Study Guide and Intervention master for each lesson in Chapter 2.

When to Use  Use these masters as reteaching activities for students who need additional reinforcement. These pages can also be used in conjunction with the Student Edition as an instructional tool for students who have been absent.

Practice: Skills  There is one master for each lesson. These provide practice that more closely follows the structure of the Practice and Applications section of the Student Edition exercises.

When to Use  These provide additional practice options or may be used as homework for second day teaching of the lesson.

Practice: Word Problems  There is one master for each lesson. These provide practice in solving word problems that apply the concepts of the lesson.

When to Use  These provide additional practice options or may be used as homework for second day teaching of the lesson.

Reading to Learn Mathematics  One master is included for each lesson. The first section of each master asks questions about the opening paragraph of the lesson in the Student Edition. Additional questions ask students to interpret the context of and relationships among terms in the lesson. Finally, students are asked to summarize what they have learned using various representation techniques.

When to Use  This master can be used as a study tool when presenting the lesson or as an informal reading assessment after presenting the lesson. It is also a helpful tool for ELL (English Language Learner) students.
**Enrichment** There is one extension master for each lesson. These activities may extend the concepts in the lesson, offer an historical or multicultural look at the concepts, or widen students’ perspectives on the mathematics they are learning. These are not written exclusively for honors students, but are accessible for use with all levels of students.

**When to Use** These may be used as extra credit, short-term projects, or as activities for days when class periods are shortened.

**Assessment Options**

The assessment masters in the *Chapter 2 Resources Masters* offer a wide range of assessment tools for intermediate and final assessment. The following lists describe each assessment master and its intended use.

**Chapter Assessment**

**Chapter Tests**

- **Form 1** contains multiple-choice questions and is intended for use with basic level students.
- **Forms 2A and 2B** contain multiple-choice questions aimed at the average level student. These tests are similar in format to offer comparable testing situations.
- **Forms 2C and 2D** are composed of free-response questions aimed at the average level student. These tests are similar in format to offer comparable testing situations. Grids with axes are provided for questions assessing graphing skills.
- **Form 3** is an advanced level test with free-response questions. Grids without axes are provided for questions assessing graphing skills.

All of the above tests include a free-response Bonus question.

- **The Extended-Response Assessment** includes performance assessment tasks that are suitable for all students. A scoring rubric is included for evaluation guidelines. Sample answers are provided for assessment.

- **A Vocabulary Test**, suitable for all students, includes a list of the vocabulary words in the chapter and ten questions assessing students’ knowledge of those terms. This can also be used in conjunction with one of the chapter tests or as a review worksheet.

**Intermediate Assessment**

- Four free-response quizzes are included to offer assessment at appropriate intervals in the chapter.
- **A Mid-Chapter Test** provides an option to assess the first half of the chapter. It is composed of both multiple-choice and free-response questions.

**Continuing Assessment**

- The **Cumulative Review** provides students an opportunity to reinforce and retain skills as they proceed through their study of *Glencoe Mathematics: Applications and Concepts, Course 1*. It can also be used as a test. This master includes free-response questions.

- The **Standardized Test Practice** offers continuing review of pre-algebra concepts in various formats, which may appear on the standardized tests that they may encounter. This practice includes multiple-choice, short response, grid-in, and extended response questions. Bubble-in and grid-in answer sections are provided on the master.

**Answers**

- Page A1 is an answer sheet for the Standardized Test Practice questions that appear in the Student Edition on pages 94–95. This improves students’ familiarity with the answer formats they may encounter in test taking.

- Detailed rubrics for assessing the extended response questions on page 95 are provided on page A2.

- The answers for the lesson-by-lesson masters are provided as reduced pages with answers appearing in red.

- Full-size answer keys are provided for the assessment masters in this booklet.
Reading to Learn Mathematics

Vocabulary Builder

This is an alphabetical list of new vocabulary terms you will learn in Chapter 2. As you study the chapter, complete each term’s definition or description. Remember to add the page number where you found the term. Add this page to your math study notebook to review vocabulary at the end of the chapter.

<table>
<thead>
<tr>
<th>Vocabulary Term</th>
<th>Found on Page</th>
<th>Definition/Description/Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>average</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bar graph</td>
<td></td>
<td></td>
</tr>
<tr>
<td>box-and-whisker plot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>circle graph</td>
<td></td>
<td></td>
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<tr>
<td>data</td>
<td></td>
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<tr>
<td>frequency table</td>
<td></td>
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</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>horizontal axis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>interval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>key</td>
<td></td>
<td></td>
</tr>
<tr>
<td>leaves</td>
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</table>
## Reading to Learn Mathematics

**Vocabulary Builder**  (continued)

<table>
<thead>
<tr>
<th>Vocabulary Term</th>
<th>Found on Page</th>
<th>Definition/Description/Example</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>measure of central tendency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>median</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>outlier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>scale</td>
<td></td>
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<tr>
<td>statistics</td>
<td></td>
<td></td>
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<tr>
<td>stem-and-leaf plot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tally mark</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vertical axis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dear Parent or Guardian:

We use math in many of our daily routines. One of the things we try to do in this class is relate activities in the classroom to activities in the real world. Making this connection will help students realize the importance of learning math concepts.

In Chapter 2, Statistics and Graphs, your child will be learning about bar graphs, line graphs, circle graphs, stem-and-leaf plots, frequency tables, and mean, median, and mode. In the study of this chapter, your child will complete a variety of daily classroom assignments and activities and possibly produce a chapter project.

By signing this letter and returning it with your child, you agree to encourage your child by getting involved. Enclosed is an activity that you can do with your child that also relates the math we will be learning in Chapter 2 to the real world. You may also wish to log on to the Online Study Tools for self-check quizzes, Parent and Student Study Guide pages, and other study help at www.msmath1.net. If you have any questions or comments, feel free to contact me at school.

Sincerely,

Signature of Parent or Guardian ___________________________ Date __________
Family Activity

Bar Graphs and Line Graphs

1. Have a family member help you count the number of cans of food, glass jars of food, boxes of food, and bags of food you have in your pantry.

<table>
<thead>
<tr>
<th>Food in Pantry</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>cans</td>
<td></td>
</tr>
<tr>
<td>glass jars</td>
<td></td>
</tr>
<tr>
<td>boxes</td>
<td></td>
</tr>
<tr>
<td>bags</td>
<td></td>
</tr>
<tr>
<td>other</td>
<td></td>
</tr>
</tbody>
</table>

2. Make a bar graph to represent the data.

3. Name the type of container of which you have the most (can, glass jar, box, or bag).

4. Do you have more cans of food or more bags of food?

5. Make a line graph of the data.

6. Do you think a line graph or a bar graph is better for answering the questions? Why?
Statistics involves collecting, organizing, analyzing, and presenting data. Data are pieces of information and are usually numbers. You can organize data by making a frequency table. A frequency table shows the number of times each piece of data appears.

The parts of a frequency table:
- Scale: lets you record all of the data; includes the least and the greatest number
- Interval: separates the scale into equal parts
- Tally marks: lets you record a mark each time a piece of data appears
- Frequency: gives the sum of the tally marks for each category

**Example 1**

**SCHOOL** Vinnie recorded his scores on this month’s math quizzes. Make a frequency table of the data. Which score did Vinnie get most often?

**Step 1** Choose a scale and interval. A scale that includes all the data is 0 to 10. An interval that separates the scale into equal parts is 2.

**Step 2** Draw a table with three columns and label the columns.

**Step 3** List the intervals, tally the data, and add the tallies.

Since the quiz score 9 has the greatest number in the frequency column, Vinnie scored 9 most often.

**Exercises**

**Music** Use the table that shows the number of hours the band members practiced in a week.

1. Make a frequency table for the data.

2. Which number of hours practicing is most common?

3. How many band members practiced more than 4 hours a week?
2-1

Practice: Skills

Frequency Tables

Make a frequency table for each set of data.

1. **Class Quiz Scores**

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
</tbody>
</table>

2. **Students’ Eye Colors**

<table>
<thead>
<tr>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
</tr>
<tr>
<td>G</td>
</tr>
<tr>
<td>R</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>V</td>
</tr>
<tr>
<td>G</td>
</tr>
<tr>
<td>H</td>
</tr>
<tr>
<td>R</td>
</tr>
<tr>
<td>R</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>V</td>
</tr>
<tr>
<td>R</td>
</tr>
<tr>
<td>R</td>
</tr>
</tbody>
</table>

L = Blue  R = Brown
G = Green  H = Hazel
V = Violet

MOVIES Use the frequency table shown.

3. Describe the scale.

4. Describe the interval.

5. What is the most common gross sales category?

<table>
<thead>
<tr>
<th>Gross Sales (millions $)</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>100–149</td>
<td>⬤⬤⬤⬤</td>
<td>14</td>
</tr>
<tr>
<td>150–199</td>
<td>⬤⬤⬤</td>
<td>5</td>
</tr>
<tr>
<td>200–249</td>
<td>⬤</td>
<td>2</td>
</tr>
<tr>
<td>250–299</td>
<td>⬤⬤⬤⬤</td>
<td>4</td>
</tr>
<tr>
<td>300–349</td>
<td>⬤⬤</td>
<td>2</td>
</tr>
</tbody>
</table>

6. How many films grossed more than $299 million?
Practice: Word Problems

Frequency Tables

ANIMALS For Exercises 1–3, use Table A. For Exercises 4–6, use Table B.

Table A

<table>
<thead>
<tr>
<th>Insects Under a Rock</th>
<th>S</th>
<th>E</th>
<th>B</th>
<th>E</th>
<th>E</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>S</td>
<td>E</td>
<td>B</td>
<td>E</td>
<td>E</td>
<td>B</td>
</tr>
<tr>
<td>S</td>
<td>E</td>
<td>E</td>
<td>B</td>
<td>S</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>S</td>
<td>B</td>
<td>E</td>
<td>E</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>B</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>E</td>
<td>B</td>
<td>S</td>
<td>E</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>S</td>
<td>E</td>
<td>E</td>
<td>S</td>
<td>E</td>
<td></td>
</tr>
</tbody>
</table>

B = beetle  E = earwig  S = sow bug

Table B

<table>
<thead>
<tr>
<th>Weights (lb) of Dogs at the Vet Clinic</th>
<th>Weight</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1–10</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>11–20</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>21–30</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>31–40</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>41–50</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

1. Maria is counting three types of insects she finds under rocks in the park for an ecology survey. Make a frequency table showing her data from Table A.

2. How many more earwigs did Maria find than beetles?

3. When Maria writes her report, she will list the insects in order of most common to least common. What order should she write in her report?

4. The strength of medicine given to a dog depends on the dog’s weight. There is a different strength for each weight group. For which weight group should a veterinarian order the most medicine? the least medicine?

5. Describe the scale and the interval in Table B.

6. How many more dogs are in the most frequent group than in the second most frequent group?
Pre-Activity  Complete the activity at the top of page 50 in your textbook. Write your answers below.

1. What is the height of the tallest tree?

2. How many trees are between 41 and 80 feet tall?

3. Tell how you might organize the heights of the trees so that the information is easier to find and read.

Reading the Lesson

Refer to the frequency table in the middle of page 50.

4. What does the number 13 in the Frequency column indicate?

5. Does the number in the Frequency column tell you anything about the frequency of individual numbers within the data set? How do you know?

6. How is frequency related to interval?

7. Why do the numbers in the Height column begin at 51 and end at 140?

8. How does an interval make it easier to read the table?

Helping You Remember

9. Write the three steps used to make a frequency table. Then, using any data set you want, make a frequency table for those numbers.
Historgrams

Often a graph is used to picture the data in a frequency table. When frequencies are pictured in a bar graph, the graph is called a histogram. For example, at the right is a histogram that pictures the frequencies of the scores on a math test. Each bar in a histogram shows the number of pieces of data in a certain interval.

Use the histogram at the right to answer each question.

1. How many scores are in the interval 81–90?

2. In which interval(s) are there exactly three scores?

3. How many scores are 70 or less?

4. Suppose that, to pass this test, a student needed a score of 61 or higher. How many students passed the test?

5. Can you tell in which interval there is the greatest number of scores? Explain.

6. Can you tell what was the highest score on the test? Explain.

7. Use the histogram at the right. In the space below, write two questions about the data in the histogram. Then answer each question.
**Example 1** Make a bar graph of the data. Compare the number of students in jazz class with the number in ballet class.

**Step 1** Decide on the scale and interval.

**Step 2** Label the horizontal and vertical axes.

**Step 3** Draw bars for each style.

**Step 4** Label the graph with a title.

About twice as many students take ballet as take jazz.

<table>
<thead>
<tr>
<th>Dance Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style</td>
</tr>
<tr>
<td>Ballet</td>
</tr>
<tr>
<td>Tap</td>
</tr>
<tr>
<td>Jazz</td>
</tr>
<tr>
<td>Modern</td>
</tr>
</tbody>
</table>

**Example 2** Make a line graph of the data. Then describe the change in Gwen’s allowance from 1998 to 2002.

**Step 1** Decide on the scale and interval.

**Step 2** Label the horizontal and vertical axes.

**Step 3** Draw and connect the points for each year.

**Step 4** Label the graph with a title.

Gwen’s allowance did not change from 1998 to 1999 and then increased from 1999 to 2002.

**Exercises**

Make the graph listed for each set of data.

1. bar graph

<table>
<thead>
<tr>
<th>Riding the Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
</tr>
<tr>
<td>Paulina</td>
</tr>
<tr>
<td>Omar</td>
</tr>
<tr>
<td>Ulari</td>
</tr>
<tr>
<td>Jacob</td>
</tr>
<tr>
<td>Amita</td>
</tr>
</tbody>
</table>

2. line graph

<table>
<thead>
<tr>
<th>Getting Ready for School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
</tr>
<tr>
<td>Monday</td>
</tr>
<tr>
<td>Tuesday</td>
</tr>
<tr>
<td>Wednesday</td>
</tr>
<tr>
<td>Thursday</td>
</tr>
<tr>
<td>Friday</td>
</tr>
</tbody>
</table>
Practice: Skills

Bar Graphs and Line Graphs

Make a bar graph for each set of data.

1. Cars Made in 2000

<table>
<thead>
<tr>
<th>Country</th>
<th>Cars (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>1</td>
</tr>
<tr>
<td>Japan</td>
<td>8</td>
</tr>
<tr>
<td>Germany</td>
<td>5</td>
</tr>
<tr>
<td>Spain</td>
<td>2</td>
</tr>
<tr>
<td>U.S.A.</td>
<td>6</td>
</tr>
</tbody>
</table>

2. People in America in 1630

<table>
<thead>
<tr>
<th>Colony</th>
<th>People (hundreds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maine</td>
<td>4</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>5</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>9</td>
</tr>
<tr>
<td>New York</td>
<td>4</td>
</tr>
<tr>
<td>Virginia</td>
<td>25</td>
</tr>
</tbody>
</table>

Use the bar graph made in Exercise 1.

3. Which country made the greatest number of cars?

4. How does the number of cars made in Japan compare to the number made in Spain?

For Exercises 5 and 6, make a line graph for each set of data.

5. Yuba County, California

<table>
<thead>
<tr>
<th>Year</th>
<th>Population (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>59</td>
</tr>
<tr>
<td>1992</td>
<td>61</td>
</tr>
<tr>
<td>1994</td>
<td>62</td>
</tr>
<tr>
<td>1996</td>
<td>61</td>
</tr>
<tr>
<td>1998</td>
<td>60</td>
</tr>
<tr>
<td>2000</td>
<td>60</td>
</tr>
</tbody>
</table>

6. Everglades National Park

<table>
<thead>
<tr>
<th>Month</th>
<th>Rainfall (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>2</td>
</tr>
<tr>
<td>February</td>
<td>2</td>
</tr>
<tr>
<td>March</td>
<td>2</td>
</tr>
<tr>
<td>April</td>
<td>2</td>
</tr>
<tr>
<td>May</td>
<td>7</td>
</tr>
<tr>
<td>June</td>
<td>10</td>
</tr>
</tbody>
</table>

7. POPULATION Refer to the graph made in Exercise 5. Describe the change in Yuba County’s population from 1990 to 2000.

8. WEATHER Refer to the graph made in Exercise 6. Describe the change in the amount of rainfall from January to June.
### Practice: Word Problems

#### Bar Graphs and Line Graphs

**TREES** For Exercises 1, 3, and 4, use Table A. For Exercises 2, 5, and 6, use Table B.

**Table A**

<table>
<thead>
<tr>
<th>Tree</th>
<th>Height (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern White</td>
<td>75</td>
</tr>
<tr>
<td>Lodgepole</td>
<td>48</td>
</tr>
<tr>
<td>Longleaf</td>
<td>110</td>
</tr>
<tr>
<td>Pitch</td>
<td>55</td>
</tr>
<tr>
<td>Ponderosa</td>
<td>140</td>
</tr>
</tbody>
</table>

**Table B**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Lemons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>26</td>
</tr>
<tr>
<td>2000</td>
<td>124</td>
</tr>
<tr>
<td>2001</td>
<td>122</td>
</tr>
<tr>
<td>2002</td>
<td>78</td>
</tr>
<tr>
<td>2003</td>
<td>55</td>
</tr>
</tbody>
</table>

1. You and Jorge are writing a report on different kinds of pine trees. Make a bar graph for the report that shows the average heights of different kinds of pine trees. Use the data from Table A.

2. Table B shows the number of lemons your tree produced each year. Make a line graph for the data in Table B.

3. Use your graph for Exercise 1. Which tree is about half as tall as a ponderosa?

4. How does the average height of a pitch pine compare to the average height of a lodgepole pine?

5. Use the line graph you made in Exercise 2. Describe the change in fruit production for your lemon tree.

6. **FRUIT** Suppose you want to make a graph of the total number of lemons produced by your lemon tree and the total number of oranges produced by your orange tree in one year. Would you make a bar graph or a line graph? Explain.
Pre-Activity  

Complete the activity at the top of page 56 in your textbook. Write your answers below.

1. What type of roller coaster is most common?

2. What might be an advantage of organizing data in a table? Are there any disadvantages of organizing data in this way?

Reading the Lesson

Compare the frequency table at the top of page 56 with the bar graph in the middle of the same page.

3. How are they similar?

4. How are they different?

5. For purposes of comparison, which do you find easier to use to compare differences among frequencies—the frequency table or the bar graph? Explain.

Refer to the line graph at the bottom of page 56.

6. Represent the same data in a table that uses only numbers.

7. Compare the table you just created with the line graph. Which do you think presents the data in a way that is easier to compare changes over periods of time? Explain.

<table>
<thead>
<tr>
<th>U.S. Wooden Roller Coasters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Helping You Remember

8. Explain how the information in a line graph differs from the information in a bar graph.
**Line Plots**

In a **line plot**, data are pictured on a number line. An $\times$ is used to represent each item of data. For example, the figure below is a line plot that pictures data about the number of CDs owned by the students in a math class.

![Line Plot](image)

**Number of CDs Owned by Students in a Math Class**

Use the line plot above to answer each question.

1. How many students own exactly eighteen CDs?

2. What number of CDs is owned by exactly three students?

3. A data item that is far apart from the rest of the data is called an outlier. Is there an outlier among these data? What is it?

4. What would you say is the number of CDs owned by the “typical” student in this class?

5. Use the data in the table to complete the line plot below. Four data points have been graphed for you.

| Number of Seconds for 24 Sixth-Graders to Run 200 Meters |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 130             | 100             | 85             | 120             | 100             | 110             | 150             | 90             | 100             | 110             |
| 125             | 105             | 100             | 70              | 125             | 85              | 95              | 130             | 105             | 90              |
| 105             | 100             | 85              | 95              | 130             | 105             | 90              | 105             | 100             |                 |

![Completed Line Plot](image)
The circle graph shows the subjects Mike studies during homework time. Which subject does Mike spend most of his time studying?

The largest section of the graph is the section representing math. So, math takes up the most time.

How does the time spent studying social studies compare to the time spent studying science?

The section representing social studies is about twice the size of the section representing science. So, twice as much time is spent on social studies as on science.

SURVEYS Use the graph that shows the results of a favorite colors survey.

1. Which color is the least favorite?

2. Which colors are the favorites of the same number of people?

3. How does the number of people who say green is their favorite color compare to the number who say yellow is their favorite color?

FOOD Use the graph of Mike’s study time from the Examples.

4. Which subject does Mike spend the least time studying?

5. On which two subjects together does Mike spend about the same time as reading?

6. How does the amount of time spent on math compare to the amount of time Mike spends on science?
GEOGRAPHY Use the graph that shows how much of Earth’s land that each continent represents.

1. Which continent has the greatest area?

2. Which two continents are the smallest?

3. How does the size of Europe compare to the size of Africa?

4. How much larger is Asia than Africa?

LAKES Use the graph that shows how much of the total surface of the Great Lakes each lake takes up.

5. Which of the Great Lakes is the smallest?

6. Which two lakes are about the same size?

7. How does Lake Erie compare to Lake Ontario?

8. Which two lakes together are the same size as Lake Superior?

VACATIONS Use the graph that shows how families will spend winter vacation.

9. How will most families spend their vacations?

10. Will more families go to the beach or go shopping?

11. Compare how many families will be skiing to how many will be visiting family.
Practice: Word Problems

Circle Graphs

SPORTS For Exercises 1–3, use Graph A. For Exercises 4–6, use Graph B.

Graph A
Favorite Sports of Mr. Franco's Class

- Baseball 49%
- Hockey 10%
- Football 21%
- Basketball 20%

Graph B
Attendance at the Baseball Game

- Age 0-15 21%
- Age 16-30 35%
- Age 31-45 25%
- Age 46-60 14%
- Age 61 and older 5%

1. Kwan surveyed Mr. Franco's class to find out the favorite sports of the class. Which sport was the favorite of the largest percent of students in the class? Which sport was the favorite of the smallest percent of students?

2. Which sports were the favorite of about the same number of students?

3. Which sport is the favorite of half as many students as basketball?

4. Mr. Jackson kept track of attendance at the baseball game for an advertising agency. The agency wants to target its advertising to the age group that has the highest percent in attendance. To which group should the agency target ads?

5. Which two age groups have about the same percent of people?

6. Mr. Jackson's daughter is in the age group with the second highest percent. In which age group is Mr. Jackson's daughter?
Pre-Activity  Complete the Mini Lab at the top of page 62 in your textbook.  
Write your answers below.

1. Make a bar graph of the data.

2. Which graph represents the data better, a circle graph or a bar graph?
   Explain.

Reading the Lesson

3. A circle graph compares parts of a whole. How is a circle well suited for this kind of representation?

4. At the bottom of page 62, the text says that the percents add up to 100%.
   Why is this important?

Helping You Remember

5. Find a circle graph in a newspaper or magazine. Explain to a classmate what the sections of the graph represent.
A Circle Graph Mystery

The circle graph below was drawn to show the leading causes of fire in the United States. However, all the labels except one have mysteriously disappeared.

Use the clues below to decide what the labels should be and where they belong. Then complete the graph. (Remember: Each label must include a word or phrase and a percent.)

Clue 1  Most fires are caused by heating equipment.

Clue 2  Fires caused by electrical wiring and fires caused by heating equipment together make up 46% of all fires.

Clue 3  The percent of fires caused by children playing is 12% less than the percent of fires caused by cooking.

Clue 4  The percent of fires caused by open flames is equal to the percent of fires caused by children playing.

Clue 5  The percent of the fires caused by cooking and the percent of fires caused by arson are together just 1% less than the percent of fires caused by heating equipment.

Clue 6  The percent of the fires caused by electrical wiring is 15% greater than the percent caused by children playing.

Clue 7  Fires caused by smoking and fires caused by arson together make up 17% of all fires.

Clue 8  Fires that result from other causes are listed in a category called other.
2-4 Study Guide and Intervention
Making Predictions

Because they show trends over time, line graphs are often used to predict future events.

**EXAMPLE 1**  The graph shows the time Ruben spends each day practicing piano scales. Predict how much time he will spend practicing his scales on Friday.

Continue the graph with a dotted line in the same direction until you reach a vertical position for Friday. By extending the graph, you see that Ruben will probably spend half an hour practicing piano scales on Friday.

**EXERCISES**

**MONEY**  Use the graph that shows the price of a ticket to a local high school football game over the last few years.

1. Has the price been increasing or decreasing? Explain.

2. Predict the price of a ticket in year 6 if the trend continues.

3. In what year do you think the price will reach $9.00 if the trend continues?

**BANKS**  Use the graph that shows the interest rate for a savings account over the last few years.

4. What does the graph tell you about interest rates?

5. If the trend continues, when will the interest rate reach 1 percent?
Practice: Skills

Making Predictions

INTERNET Use the graph that shows Internet users in the United States.

1. Describe the change in active Internet users from April 2000 to April 2001.

2. Predict how many active users there were in October 2001 if the trend continued.

3. Predict when the number of active users exceeded 115 million if the trend continued.


SPORTS Use the graph that shows the winning times of the 10K Biathlon rounded to the nearest minute.

5. How did the winning time change from 1980 to 2002?

6. To the nearest minute, by how much did the winning time change from 1980 to 2002?

7. Predict the winning time for 2006 if the trend continues.

8. Predict when the winning time will be less than 20 minutes if the trend continues.
**Practice: Word Problems**

**Making Predictions**

**FITNESS** For Exercises 1–3, use Graph A. For Exercises 4–6, use Graph B.

**Graph A**

**Aerobics Class**

<table>
<thead>
<tr>
<th>Week</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

**Graph B**

**Sit-ups**

<table>
<thead>
<tr>
<th>Week</th>
<th>Number of Sit-ups</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
</tr>
</tbody>
</table>

1. Refer to Graph A. Describe the change in the number of students taking the aerobics class.

2. Predict how many students will be in the aerobics class in week 6 if the trend continues.

3. Predict how many students will be in the aerobics class in week 8.

4. Describe the change in the number of sit-ups Cara can do.

5. Predict how many sit-ups Cara will be able to do in week 6 if the trend continues.

6. Predict the week in which Cara will be able to do 80 sit-ups if the trend continues.
Pre-Activity  Complete the activity at the top of page 66 in your textbook. Write your answers below.

1. Describe the trends in the winning amounts.

2. Make a prediction as to the amount of money the winner of the 2005 Daytona 500 will receive.

Reading the Lesson
Refer to the sentence just below the activity at the top of page 66: “Line graphs are often used to predict future events because they show trends over time.”

3. The word predict comes from two Latin words that mean “to tell in advance.” Look up the word predict in a dictionary. What meaning is given for the word?

4. Look up the word trend in a dictionary. What meaning is given for the word as it is used in the definition of line graph?

5. Look at the line graph at the bottom of page 66. In terms of trend, what happened between 1997 and 1998? What is the difference between prediction and data or statistics?

Helping You Remember

6. Find two line graphs, one where you feel you can predict the future with confidence and one where you cannot. Explain the difference.
Graphs and Decision Making

Just as important as knowing how to make a bar graph or a line graph is deciding what type of graph to use. Here are some guidelines to help you make that decision.

- A bar graph compares data that fall into distinct categories.

Example: Use a bar graph to show how the populations of several cities compare in one year.

- A line graph shows changes in data over a period of time.

Example: Use a line graph to show how the population of one city changed over several years.

Would you use a bar graph or a line graph to show these data?

1. average temperatures in Sacramento for each month of the year
2. average temperatures in January in five California cities
3. land area of the continents
4. number of CD players purchased each year from 1981 through 1990
5. weight of a baby in each month from birth to one year of age
6. heights of the world’s five tallest trees

Make an appropriate graph for each set of data.

### 7. Cars in Use

<table>
<thead>
<tr>
<th>Year</th>
<th>Number (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>80</td>
</tr>
<tr>
<td>1980</td>
<td>105</td>
</tr>
<tr>
<td>1990</td>
<td>124</td>
</tr>
<tr>
<td>2000</td>
<td>136</td>
</tr>
</tbody>
</table>

### 8. Seating Capacity of Aircraft

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of Seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>B747</td>
<td>405</td>
</tr>
<tr>
<td>DC-10</td>
<td>288</td>
</tr>
<tr>
<td>L-1011</td>
<td>296</td>
</tr>
<tr>
<td>MD-80</td>
<td>142</td>
</tr>
</tbody>
</table>
Sometimes it is hard to read data in a table. You can use a stem-and-leaf plot to display the data in a more readable way. In a stem-and-leaf plot, you order the data from least to greatest. Then you organize the data by place value.

**EXAMPLE 1** Make a stem-and-leaf plot of the data in the table. Then write a few sentences that analyze the data.

**Step 1** Order the data from least to greatest.

41 51 52 53 55 60 65 66 67 68 70 72

**Step 2** Draw a vertical line and write the tens digits from least to greatest to the left of the line.

**Step 3** Write the ones digits to the right of the line with the corresponding stems.

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1  2  3  5</td>
</tr>
<tr>
<td>6</td>
<td>0  5  5  7  8</td>
</tr>
<tr>
<td>7</td>
<td>0  2</td>
</tr>
</tbody>
</table>

Key: 6 | 5 = $65

**Step 4** Include a key that explains the stems and leaves.

By looking at the plot, it is easy to see that the least amount of money earned was $41 and the greatest amount was $72. You can also see that most of the data fall between $51 and $68.

**EXERCISES**

Make a stem-and-leaf plot for the set of data below. Write a few sentences that analyze the data.

34 44 51 48 55 41 47 22 55
Stem-and-Leaf Plots

Make a stem-and-leaf plot for each set of data.

1. 18, 16, 13, 20, 33, 58, 32, 14, 61, 67, 52
2. 61, 75, 62, 63, 74, 71, 75, 82, 64, 81, 91, 65
3. $52, $49, $37, $21, $65, $23, $49, $51, $22, $21, $24, $47, $44, $53, $61
4. 82°, 91°, 80°, 55°, 63°, 54°, 83°, 90°, 84°, 91°, 59°, 62°, 50°, 92°, 85°, 92°, 92°

SPORTS For Exercises 5–8, use the stem-and-leaf plot that shows the total number of points earned by each volleyball team at a tournament.

5. What was the greatest number of points earned?

6. What was the least number of points earned?

7. How many teams earned more than 50 points?

8. Between what numbers are most of the points earned?
### 2-5 Practice: Word Problems

#### Stem-and-Leaf Plots

**TRAFFIC** For Exercises 1 and 2, use the table. For Exercises 3 and 4, use the stem-and-leaf plot.

| Number of Trucks Passing Through the Intersection Each Hour | Number of Birds at a Watering Hole Each Hour
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stem</td>
</tr>
<tr>
<td>5 15 6 42 34 28</td>
<td>1 15</td>
</tr>
<tr>
<td>19 18 19 22 23 21</td>
<td>2 18</td>
</tr>
<tr>
<td>32 26 34 19 29 21</td>
<td>3 32</td>
</tr>
<tr>
<td>10 8 40 14 17</td>
<td>4 10</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

3 | d = 34 birds

---

1. Mr. Chin did a traffic survey. He wrote down the number of trucks that passed through an intersection each hour. Make a stem-and-leaf plot of his data.

2. Refer to your stem-and-leaf plot from Exercise 1. Mr. Chin needs to know the range of trucks passing through the intersection in one hour into which the greatest number of hours fall.

3. What is the least number of birds at the watering hole in one hour? What is the greatest number?

4. What is the most frequent number of birds to be at the watering hole in one hour?

5. **RVs** Make a stem-and-leaf plot for the number of RVs Mr. Chin counted in 12 hours: 3, 4, 9, 13, 7, 9, 8, 5, 4, 6, 1, 11.

6. **RVs** Write a few sentences that analyze the RV data for Mr. Chin’s report in Exercise 5.
Pre-Activity  Complete the activity at the top of page 72 in your textbook. Write your answers below.

1. What were the least and greatest number of points scored?

2. Which number of points occurred most often?

Reading the Lesson

3. In a stem-and-leaf plot, in what order are the data?

4. In a stem-and-leaf plot of two-digit numbers, how are the data represented?

5. In the box below the stem-and-leaf plot on page 72, it says "Always write each leaf even if it repeats." Because of this rule, what do the leaves of a stem-and-leaf plot tell you that you do not know from a frequency table?

6. Look at the stem-and-leaf plot at the top of page 73. What number of butterflies per day occurs the most often in the stem-and-leaf plot? What does that number indicate?

Helping You Remember

7. Write the steps for making a stem-and-leaf plot. Show someone what a stem-and-leaf plot is, how to read one, and how to make one.
A back-to-back stem-and-leaf plot is used to compare two sets of data. In this type of plot, the leaves for one set of data are on one side of the stems, and the leaves for the other set of data are on the other side of the stems. Two keys to the data are needed.

ELECTIONS Use the back-to-back stem-and-leaf plot of the electoral votes cast by each state and the District of Columbia for the Democratic and Republican candidates for U.S. president in 2000.

<table>
<thead>
<tr>
<th>Democrat</th>
<th>Stem</th>
<th>Republican</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 3 3 4 4 4 5 7 7 8</td>
<td>0</td>
<td>3 3 3 3 3 4 4 4 5 5 5 6 6 7 8 8 8 8 8 9 9</td>
</tr>
<tr>
<td>0 0 1 1 2 5 8</td>
<td>1</td>
<td>1 1 2 3 3 4</td>
</tr>
<tr>
<td>2 3</td>
<td>2</td>
<td>1 5</td>
</tr>
<tr>
<td>3 3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2 | 0 = 2 votes 0 | 3 = 3 votes

1. What is the greatest number of electoral votes cast by a state for the Democratic candidate? the greatest number of electoral votes cast by a state for the Republican candidate?

2. Which candidate received votes from the greater number of states?

3. Which candidate received the greater number of total votes?

4. What is the difference between the number electoral votes cast for the candidates?

5. Write a sentence or two comparing the number of electoral votes cast for the two candidates.
**2-6 Study Guide and Intervention**

**Mean**

The **mean** is the most common measure of central tendency. It is an average, so it describes all of the data in a data set.

---

**EXAMPLE 1** The prices of twelve different jackets are shown. Find the mean.

\[
\text{mean} = \frac{25 + 34 + 39 + \ldots + 27}{12} = \frac{444}{12} \text{ or } 37
\]

The mean price of a jacket is $37.

---

**EXAMPLE 2** Find the mean for the snowfall data with and without the outlier. Then tell how the outlier affects the mean of the data.

<table>
<thead>
<tr>
<th>Month</th>
<th>Snowfall (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov.</td>
<td>20</td>
</tr>
<tr>
<td>Dec.</td>
<td>19</td>
</tr>
<tr>
<td>Jan.</td>
<td>20</td>
</tr>
<tr>
<td>Feb.</td>
<td>17</td>
</tr>
<tr>
<td>Mar.</td>
<td>4</td>
</tr>
</tbody>
</table>

Compared to the other values, 4 inches is low. So, it is an outlier.

\[
\text{mean with outlier} = \frac{20 + 19 + 20 + 17 + 4}{5} = \frac{80}{5} \text{ or } 16
\]

\[
\text{mean without outlier} = \frac{20 + 19 + 20 + 17}{4} = \frac{76}{4} \text{ or } 19
\]

With the outlier, the mean is less than the values of most of the data. Without the outlier, the mean is close in value to the data.

---

**EXERCISES**

Find the mean for each set of data.

1. 11, 8, 7, 12, 10, 9, 13, 26  
2. 15, 10, 9, 17, 24, 27, 39, 15, 24

3. 26, 19, 29, 15, 2, 31, 56, 30  
4. 108, 121, 73, 79, 56, 91

5. Find the mean for the set of data in Exercise 1 without the outlier. Then tell how the outlier affects the mean of the data.
Practice: Skills

Mean

Find the mean for each set of data.

1. 6, 9, 2, 4, 3, 6, 5

2. 25, 18, 14, 27, 25, 14, 18, 25, 23

3. 13, 6, 7, 13, 6

4. 8, 2, 9, 4, 6, 8, 5

5. 13, 7, 17, 19, 7, 15, 11, 7

6. 1, 15, 9, 12, 18, 9, 5, 14, 7

7. 28, 32, 23, 43, 32, 27, 21, 34

8. 30, 16, 29, 32, 14, 21, 26

9. 42, 35, 27, 42, 38, 35, 29, 24

10. 157, 124, 157, 124, 157, 139

Identify the outlier or outliers in each set of data.

11. Price | Tally | Frequency

   | $10 |   ||   | 4
   | $20 |   |||   | 5
   | $30 |   ||   | 3
   | $40 |   ||   | 1

12. Stem | Leaf

   | 2 | 0 1 4 7
   | 3 | 0 0 1 5 6
   | 4 | 3 6
   | 5 | 7

   2 4 = 24

WEATHER Use the data in the table that shows daily temperatures.

13. Identify the outlier.

14. What is the mean of the data with the outlier included?

15. What is the mean of the data without the outlier included?

16. How does the outlier temperature affect the mean of the data?
Practice: Word Problems

Mean

ANIMALS For Exercises 1–3, use the table about bears.

<table>
<thead>
<tr>
<th>Bear</th>
<th>Average Height (ft)</th>
<th>Average Weight (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaskan Brown</td>
<td>8</td>
<td>1,500</td>
</tr>
<tr>
<td>Black</td>
<td>6</td>
<td>338</td>
</tr>
<tr>
<td>Grizzly</td>
<td>7</td>
<td>588</td>
</tr>
<tr>
<td>Polar</td>
<td>7</td>
<td>850</td>
</tr>
</tbody>
</table>

1. You are writing a report on bears. You are analyzing the data on heights and weights in the table above. First look for outliers. Identify the outlier for the height data. Identify the outlier for the weight data.

2. Find the mean of the bear weight data with and without the outlier.

3. Describe how the outlier affects the mean of the bear weight data.

4. WORK Carlos earned $23, $29, $25, $16, and $17 working at an ice cream shop after school. What is the mean amount he earned?

5. CARS The cost of a tank of gas at nine different gas stations is shown below. What was the mean cost of a tank of gas?

   Cost of Gas: $17, $18, $22, $15, $17, $16, $25, $21, and $20

6. SCHOOL Sally received scores on math quizzes as shown below. Find her mean score with and without both outliers.

   Quiz Scores: 84, 85, 91, 81, 52, 92, 99, 91, and 45
Pre-Activity  Complete the Mini Lab at the top of page 76 in your textbook. Write your answers below.

1. How many pennies are in each cup?

2. For the five quizzes, your average score was _______ points.

3. Suppose your teacher gave you another quiz and you scored 14 points. How many pennies would be in each cup?

Reading the Lesson

4. Look up the word *mean* in a dictionary. Write the meaning that fits the way the word is used in this lesson.

Look at the paragraph below the activity at the top of page 76 in your textbook. A number that helps describe all of the data in a data set is an average. An average is also referred to as a measure of central tendency.

5. Is the mean a good measure of central tendency when there is no outlier? Give an example.

6. Is the mean a good measure of central tendency when there is an outlier? Give an example.

Helping You Remember

7. Explain one problem with using the mean as a measure of central tendency.
Linguistic Statistics

Linguistics is the study of human speech. The activity on this page shows the type of data collection and analysis that might be done by a linguist who is researching the structure of the English language. All questions refer to the Preamble to the U.S. Constitution, printed at the bottom of the page.

1. Which two consonants do you think appear most often in the Preamble?
2. Which vowel do you think appears most often in the Preamble? least often?
3. Complete this table by counting the occurrences of each letter. A few letters have been counted already, to help you get started. (Hint: Your total should be 268.)

<table>
<thead>
<tr>
<th>Letter</th>
<th>Frequency</th>
<th>Letter</th>
<th>Frequency</th>
<th>Letter</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td></td>
<td>j</td>
<td></td>
<td>s</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td></td>
<td>k</td>
<td></td>
<td>t</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td></td>
<td>l</td>
<td></td>
<td>u</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>11</td>
<td>m</td>
<td></td>
<td>v</td>
<td></td>
</tr>
<tr>
<td>e</td>
<td></td>
<td>n</td>
<td>17</td>
<td>w</td>
<td></td>
</tr>
<tr>
<td>f</td>
<td></td>
<td>o</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>g</td>
<td></td>
<td>p</td>
<td></td>
<td>y</td>
<td></td>
</tr>
<tr>
<td>h</td>
<td>9</td>
<td>q</td>
<td></td>
<td>z</td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>r</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Which two consonants actually appear most often in the Preamble?
5. Find the mean frequency for the consonants. Which two consonants occur the closest number of times to this mean?
6. Which vowel actually appears most often in the Preamble? least often?
7. Find the mean frequency for the vowels. Which vowel occurs the closest number of times to this mean?
8. Which word do you think occurs most often in the Preamble? Verify your answer.

Preamble to the Constitution of the United States of America

We the People of the United States, in order to form a more perfect Union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America.
The median is the middle number of the data put in order, or the mean of the middle two numbers. The mode is the number or numbers that occur most often.

**Example 1** The table shows the costs of seven different books. Find the mean, median, and mode of the data.

<table>
<thead>
<tr>
<th>Book Costs ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 13 11 16</td>
</tr>
<tr>
<td>14 13 16</td>
</tr>
</tbody>
</table>

mean: \( \frac{22 + 13 + 11 + 16 + 14 + 13 + 16}{7} = \frac{105}{7} = 15 \)

To find the median, write the data in order from least to greatest.

median: 11, 13, 13, 14, 16, 16, 22

To find the mode, find the number or numbers that occur most often.

mode: 11, 13, 13, 14, 16, 16, 22

The mean is $15. The median is $14. There are two modes, $13 and $16.

Whereas the measures of central tendency describe the average of a set of data, the range of a set of data describes how the data vary.

**Example 2** Find the range of the data in the table. Then write a sentence describing how the data vary.

<table>
<thead>
<tr>
<th>Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 32 55</td>
</tr>
<tr>
<td>60 63 50</td>
</tr>
</tbody>
</table>

The greatest value is 63. The least value is 32. So, the range is \( 63° - 32° = 31° \). The range is large. It tells us that the data vary greatly in value.

**Exercises**

Find the mean, median, mode, and range of each set of data.

1. 14, 13, 14, 16, 8

2. 29, 31, 14, 21, 31, 22, 20

3. 72 60 80

4. 68 72 86

3. 2 6 5 4

4. 3 0 1
# 2-7 Practice: Skills

## Median, Mode, and Range

Find the mean, median, mode, and range for each set of data.

1. 6, 9, 2, 4, 3, 6, 5  
2. 13, 6, 7, 13, 6  
3. 1, 15, 9, 12, 18, 9, 5, 14, 7  
4. 13, 7, 17, 19, 7, 15, 11, 7  
5. 3, 9, 4, 3, 9, 4, 2, 3, 8  
6. 25, 18, 14, 27, 25, 14, 18, 25, 23  
7. 8, 3, 9, 4, 6, 7, 5  
8. 28, 32, 23, 43, 32, 27, 21, 34  
9. 157, 124, 157, 124, 157, 139  
10. 42, 35, 27, 42, 38, 35, 29, 24  

11. Write a sentence that describes how the data items in Exercise 5 vary.

12. Why is mode not the best choice to describe the data in Exercise 5? Explain.

## MUSEUMS

Use the table showing the number of visitors to the art museum each month.

<table>
<thead>
<tr>
<th>Visitors to the Art Museum (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 11 5 4</td>
</tr>
<tr>
<td>5 3 6 3</td>
</tr>
<tr>
<td>12 2 2 4</td>
</tr>
</tbody>
</table>

13. What is the mean of the data?

14. What is the median of the data?

15. What is the mode of the data?

SCIENCE  For Exercises 1–3, use Table A. For Exercises 4–6, use Table B. Table A shows the number of days it took for some seeds to germinate after planting. Table B shows how tall the plants were after 60 days.

<table>
<thead>
<tr>
<th>Table A</th>
<th>Table B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Days for Seeds to Germinate</strong></td>
<td><strong>Height (in.) of Plants After 60 Days</strong></td>
</tr>
<tr>
<td>15  20  30  15  16</td>
<td>17  19  13  17  20</td>
</tr>
<tr>
<td>9  21  21  15</td>
<td>15  17  21  14</td>
</tr>
</tbody>
</table>

1. Refer to Table A. You are doing some experiments with germinating seeds. You are preparing a report on your findings to a seed company. What are the mean, median, and mode of the data?

2. Use your answer from Exercise 1. Which measure of central tendency best describes the data? Explain.

3. What is the range of the seed germination data? Describe how the data vary.

4. What are the mean, median, and mode of the plant height data?

5. Refer to your answer in Exercise 4. Which measure of central tendency best describes the data? Explain.

6. What is the range of the plant height data? Describe how the data vary.
Pre-Activity  Complete the activity at the top of page 80 in your textbook. Write your answers below.

1. Find the mean wingspan.

2. List the data in order from least to greatest.

3. Which data are in the middle of the arranged data?

4. Compare the number that is in the middle of the data set to the mean of the data.

Reading the Lesson

5. How are mean, median, and mode similar? How are they different?

Look at Example 3 at the bottom of page 81. Also, look at its opening statement, "Some averages may describe a data set better than other averages."

6. Which averages are discussed in the example?

7. What is causing the mean to be so high?

8. What if there were two 54s? How would that affect the averages?

9. Does this example illustrate its opening statement?

Helping You Remember

10. You may already know that a median strip refers to the concrete or landscaped divider that runs down the center of many roads. How does this idea of median relate to the meaning of median in this lesson?
Puzzling Over Data

Each puzzle on this page contains an incomplete set of data. The clues give you information about the mean, median, mode, or range of the data. Working from these clues, you can decide what the missing data items must be. For example, this is how you might solve the data puzzle at the right.

There are 6 items of data.
The mean is 18, so the sum of the data must be $6 \times 18 = 108$.
Add the given data: $12 + 17 + 18 + 19 + 19 = 85$.

So the complete set of data is: $12, 17, 18, 19, 19, 23$.

Find the missing data. (Assume that the data items are listed in order from least to greatest.)

1. **Clue**: mode = 8
   
   **Data**: 7, 7, 8, __, __, 14

2. **Clue**: median = 54.5
   
   **Data**: 36, 40, 49, __, 65, 84

3. **Clues**: mean = 27
   
   mode = 30
   
   **Data**: 10, 25, 27, __, 30, __

4. **Clues**: median = 120
   
   range = 46
   
   **Data**: 110, 112, __, 124, 136, __

5. **Clues**: mean = 13
   
   median = 13
   
   range = 13
   
   **Data**: __, 9, 12, __, 18, __

6. **Clues**: mean = 7
   
   median = 8.5
   
   mode = 10
   
   **Data**: __, 4, 8, __, __, __

7. **Clues**: mean = 60
   
   mode = 52
   
   range = 28
   
   **Data**: __, 52, __, __, 72, 78

8. **Clues**: median = 24
   
   mode = 28
   
   range = 24
   
   **Data**: 6, 15, __, __, __, __
The graphs at the right show how the cost of a movie increased over time. Which graph appears to show that the cost increased more quickly? Explain.

Both graphs show the same data, but Graph B appears to show the cost increasing more quickly. Graph A uses a scale of 2 and Graph B uses a scale of 1.

Using an inappropriate measure of central tendency can cause readers to make a wrong conclusion.

Order the data from least to greatest: 12, 12, 12, 14, 15, 15, 20, 20, 21, 49.

mean: $19  median: $15  mode: $12

The store used the mode as the average. Because the mode price is less than the other prices, it is not the most accurate average to use.

1. In Example 1, how could you change Graph A to appear to show that the cost rose more slowly?

2. Oleta’s test scores in order from least to greatest were 19, 75, 76, 82, 83. Find the mean, median, and mode of the data. Which measure might be misleading in describing the average number of points Oleta earned.
ANIMALS  For Exercises 1–3, use the graph that shows the weight of bears.

1. About how many times heavier does a grizzly bear appear to be than a black bear?

2. Explain how this graph is misleading.

3. Redraw the graph so that it is not so misleading.

4. BUSINESS  The graphs below show company sales. Which graph makes the sales appear to be increasing more rapidly? Explain.

BUDGETS  Use the table that shows the 2003 budgets for eight national parks.

5. Find the mean, median, and mode of the data.

6. Which measure would be misleading in describing the average budget for these parks? Explain.

7. Which measure describes the data most accurately? Explain.
Practice: Word Problems

Analyzing Graphs

BUSINESS For Exercises 1 and 2, use Graph A. For Exercises 3 and 4, use Graphs B and C. The graphs show the number of DVDs and videos sold by a video store.

1. About how many times fewer DVDs than videos appear to have been sold?

2. Explain how Graph A is misleading.

3. The graphs show the same data. Which graph appears to shows that the number of DVDs and videos sold increased more rapidly? Explain.

4. The store owner is trying to get a loan from the bank and wants to show that business is good. Which graph should the store owner show the bank? Explain.

5. MARKETING A store advertises that it has the lowest average price for T-shirts in town. Find the mean, median, and mode of the prices.

   T-Shirt Prices: $14, $5, $10, $12, $5, $4, $13

6. MARKETING Use your answer from Exercise 5. Which measure of central tendency describes the average T-shirt price the most accurately? Explain.
Pre-Activity  
*Complete the activity at the top of page 86 in your textbook. Write your answer below.*

1. Suppose you look at the lengths of the bars that represent Dan Marino and Terry Bradshaw. You might conclude that Dan Marino threw three times as many touchdown passes as Terry Bradshaw. Why is this conclusion incorrect?

Reading the Lesson

For Exercises 2–4, look at the first sentence below the activity at the top of page 86: “Graphs let readers analyze and interpret data easily.”

2. Look in a dictionary for meaning of the word *analyze*. Write a definition that fits the sentence just quoted.

3. Do the same for the word *interpret*. Write a definition that fits the sentence just quoted.

4. Why is it important to analyze as well as interpret data in a graph?

5. Why is the graph in the activity at the top of page 86 misleading?

6. On a separate sheet of paper, redraw the graph in the activity at the top of page 86 to correct the problem. Do the lengths of the Marino and Bradshaw bars represent more closely the relationship between touchdown passes actually thrown by these players?

Helping You Remember

7. Look up the word *mislead* in a dictionary. Write the definition here. Then tell how it is easy for a graph to mislead.
Be a Data Detective!

Each of the graphs on this page has been drawn incorrectly. Can you detect the mistake?

1. **Weekly Book Sales**
   - Fiction
   - Biography
   - Reference
   - Other

   **Mistake:**

2. **United States Population**

   **Mistake:**

3. **Areas of the Great Lakes**

   **Mistake:**

4. **Retail Sales of Automobiles**

   **Mistake:**

5. Draw a corrected graph for Exercise 3.
TELEVISION  Refer to the frequency table.

1. What is the most common age of cartoon watchers?

2. How many people 11 years or older watched cartoons?
   F. 18  G. 19  H. 11

ANIMALS  Refer to the bar graph.

3. Which animal has the same average lifespan as a wolf?
   A. rabbit  B. horse  C. giraffe  D. monkey

4. Which animal lives twice as long as a giraffe?
   F. rabbit  G. horse  H. wolf  I. monkey

MONEY  Refer to the line graph.

5. What was Logan’s balance in March?
   A. $100  B. $150  C. $200  D. $250

6. What is the best prediction for Logan’s May balance?
   F. $200  G. $250  H. $300  I. $350

FOOD  Refer to the circle graph.

7. Which fruit is most popular?
   A. apple  B. peach  C. banana  D. orange

8. Which fruit is least popular?
   F. apple  G. peach  H. banana  I. orange

Refer to the stem-and-leaf plot.

9. What is the greatest number shown in the plot?
   A. 67  B. 53  C. 35  D. 1,044
10. How many numbers shown are less than 20?
   F. 0  G. 5  H. 2  I. 3  10. ____

11. How many times is the number 14 shown in the plot?
   A. 0  B. 1  C. 2  D. 3  11. ____

**Butterflies** Refer to the table that shows Miko’s butterfly counts.

12. What is the mean of the butterfly counts?
   F. 10  G. 12  H. 13  I. 20  12. ____

13. Which value is the outlier?
   A. 10  B. 13  C. 15  D. 52  13. ____

14. What is the mean without the outlier?
   F. 10  G. 12  H. 13  I. 20  14. ____

15. What is the median of the butterfly counts?
   A. 10  B. 12  C. 13  D. 20  15. ____

16. What is the mode of the butterfly counts?
   F. 10  G. 12  H. 13  I. 20  16. ____

17. What is the range of the butterfly counts?
   A. 10 to 60  B. 10 to 52  C. 42  D. 52  17. ____

**Animals** Refer to the bar graph.

18. How many years is a horse expected to live?
   F. 10  G. 15  H. 20  I. 30  18. ____

19. How many years is a monkey expected to live?
   A. 10  B. 15  C. 18  D. 20  19. ____

20. Why is the graph misleading?
   F. The interval starts at 10, not 0.  G. Not enough animals are shown.  H. The scale starts at 10, not 0.  I. The interval is not consistent.  20. ____

**Bonus Money** Sophie’s savings usually increases each month. The only time it decreased was in March, when she withdrew some money for a new bike. On a separate sheet of paper, draw a line graph that could show her savings from January through May.
SPORTS Refer to the frequency table.

1. What is the interval for the least common number of hours of sports watched?
   A. 1–2
   B. 3–4
   C. 5–6
   D. 7–8

2. How many people spent 3 or more hours watching sports events?
   F. 5
   G. 6
   H. 9
   I. 14

NAME Refer to the bar graph.

3. What two names shown had about the same popularity?
   A. Lily and Daisy
   B. Daisy and Heather
   C. Lily and Heather
   D. Rose and Daisy

4. How did the popularity of the name Lily compare with that of Rose?
   F. Rose was given about the same number of times as Lily.
   G. Rose was given about three times more often than Lily.
   H. Lily was given about twice as often as Rose.
   I. Lily was given about three times more often than Rose.

MONEY Refer to the line graph.

5. In what month did the greatest increase in sales occur?
   A. January
   B. February
   C. March
   D. April

6. What is the best prediction for June sales?
   F. $2,000
   G. $2,250
   H. $2,500
   I. $3,000

FOOD Refer to the circle graph.

7. What is the main ingredient?
   A. banana
   B. pineapple
   C. yogurt
   D. ice

8. Which two ingredients make up more than half of a Tropical Smoothie?
   F. ice and banana
   G. banana and yogurt
   H. banana and orange
   I. yogurt and ice
Chapter 2 Test, Form 2A  (continued)

Use the stem-and-leaf plot.

9. What is the greatest number shown in the plot?
   A. 39  B. 38  C. 79  D. 203,779
   - Stem | Leaf
   1     | 0 7
   2     | 0 3 7 7 9
   3     | 1 8

9. ____

10. What is the least number shown in the plot?
    F. 0  G. 1  H. 10  I. 107

10. ____

11. How many numbers shown are less than 30?
    A. 0  B. 2  C. 5  D. 7

11. ____

12. How many times is the number 27 shown in the plot?
    F. 0  G. 1  H. 2  I. 3

12. ____

SHOPPING  For Exercises 13–19, refer to the table.

13. What is the mean cost of shoes at the store?
    A. $29  B. $30  C. $32  D. $40

13. ____

14. What is the mean cost without the outlier?
    F. $29  G. $30  H. $32  I. $40

14. ____

15. Which value is the outlier?
    A. $8  B. $32  C. $40  D. $22

15. ____

16. What is the median of the data?
    F. $29  G. $30  H. $32  I. $40

16. ____

17. What is the mode of the data?
    A. $40  B. $31  C. $22 and $40  D. $22

17. ____

18. What is the range of the data?
    F. $8  G. $1 to $40  H. $8 to $40  I. $32

18. ____

19. Which measure of central tendency is the most misleading?
    A. none  B. mode  C. median  D. mean

19. ____

20. Why is the bar graph at the right misleading?
    F. The interval starts at 50, not 0.
    G. Not enough foods are shown.
    H. The scale starts at 50, not 0.
    I. The interval is not consistent.

20. ____

Bonus  If three numbers have a mode of 4 and a mean of 5, what are the three numbers?
   B: ____________
MUSIC  Refer to the frequency table.

1. What is the most common age of music store customers?
   A. 5–8  B. 9–12  C. 13–16  D. 17–20
   Score: ___

2. How many people 12 years or younger shopped at the music store?
   F. 2   G. 10   H. 8   I. 49
   Score: ___

NAMES  Refer to the bar graph.

3. What two names shown had about the same popularity?
   A. Rose and Iris  B. Rosemary and Iris  C. Violet and Rosemary  D. Rose and Rosemary
   Score: ___

4. How did the popularity of the name Iris compare with that of Violet?
   F. Violet was given about the same number of times as Iris.
   G. Violet was given about twice as often as Iris.
   H. Iris was given about twice as often as Violet.
   I. Iris was given about three times more often than Violet.
   Score: ___

MONEY  Refer to the line graph.

5. In what month did the greatest decrease in sales occur?
   A. January  B. March  C. February  D. April
   Score: ___

6. What is the best prediction for June sales?
   F. $500  G. $1,000  H. $1,250  I. $1,500
   Score: ___

FOOD  Refer to the circle graph.

7. What is the main ingredient?
   A. ice  B. watermelon  C. milk  D. blackberry
   Score: ___

8. Which two ingredients make up more than half of a Summer Smoothie?
   F. watermelon and ice  G. milk and watermelon  H. milk, ice, and blackberry  I. blackberry and milk
   Score: ___
Use the stem-and-leaf plot.

9. What is the greatest number shown in the plot?
   A. 47  B. 48  C. 67  D. 323,668

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0 9</td>
</tr>
<tr>
<td>3</td>
<td>2 3 6 6 7</td>
</tr>
<tr>
<td>4</td>
<td>1 7</td>
</tr>
<tr>
<td>9</td>
<td>3 2 = 32</td>
</tr>
</tbody>
</table>

10. What is the least number shown in the plot?
   F. 0  G. 2  H. 20  I. 209

11. How many numbers shown are less than 40?
   A. 7  B. 5  C. 2  D. 0

12. How many times is the number 36 shown in the plot?
   F. 0  G. 1  H. 2  I. 3

SHOPPING For Exercises 13–19, refer to the table.

13. What is the mean cost of a dress at the store?
   A. $38  B. $40  C. $42  D. $50

14. What is the mean cost without the outlier?
   F. $38  G. $40  H. $42  I. $50

15. Which value is the outlier?
   A. $38  B. $10  C. $42  D. $50

16. What is the median of the data?
   F. $38  G. $40  H. $42  I. $50

17. What is the mode of the data?
   A. $32  B. $40  C. $32 and $50  D. $50

18. What is the range of the data?
   F. $8  G. $40  H. $10 to $50  I. $52

19. Which measure of central tendency is the most misleading?
   A. none  B. median  C. mode  D. mean

20. Why is the bar graph at the right misleading?
   F. The interval starts at 4, not 0.
   G. Not enough foods are shown.
   H. The scale starts at 4, not 0.
   I. The vertical scale is not consistent.

Bonus If three numbers have a mode of 3 and a mean of 5, what are the three numbers?

B: __________________
VOTING  Refer to the table that shows the number of votes cast for Mia (M), Ali (A), Ted (T), and Hattie (H) for best costume.

1. Make a frequency table for the data.

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>T</th>
<th>A</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOTES</td>
<td>M</td>
<td>T</td>
<td>A</td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>T</td>
<td>H</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>A</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>M</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>T</td>
<td>A</td>
<td>M</td>
</tr>
</tbody>
</table>

2. Who won first place?

3. Make a vertical bar graph of the data.

4. How does the number of votes for Hattie compare to votes for Mia?

POLLS  Refer to the circle graph that shows the result of an online poll.

4. Which topping is most popular?

5. Which two toppings are about equally favored?

6. How does onion compare with mushroom as a favorite pizza topping?

SHOPPING  Refer to the table of book costs.

8. Identify the outlier.

<table>
<thead>
<tr>
<th>Book Costs ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 5 9 49 11 5</td>
</tr>
</tbody>
</table>

9. Find the mean cost of a book at the store. How does the outlier affect the mean?

10. The store claims the average item costs $5. Which measure of central tendency are they using to describe the data? Is their claim misleading? Explain.
Refer to the table of test scores.

11. Make a stem-and-leaf plot of the data.

<table>
<thead>
<tr>
<th>Test Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>68 73 72 79</td>
</tr>
<tr>
<td>81 79 91 87</td>
</tr>
<tr>
<td>85 92 95 87</td>
</tr>
<tr>
<td>66 87 96 90</td>
</tr>
</tbody>
</table>

12. How many students scored 80 or more on the test?

13. What is the range of the scores?

14. What are the median and mode of the scores?

Ella's savings account balance for January through July was $250, $80, $100, $120, $225, $250, and $275, respectively.

15. Draw a line graph of Ella's savings for the 7 months.

16. Ella bought a stereo, and her savings decreased that month. In which month did she buy the stereo?

17. Predict Ella’s balance in August. Explain how you made your prediction.

Last month, Simone did the dishes 16 times, and Dion did them 12 times. Refer to the graphs that they made for their mom.

18. Simone claims she does the dishes twice as often as her brother. Which graph is Simone’s?

19. Dion claims he does the dishes nearly as often as his sister. Which graph is Dion’s?

20. Explain how they made the graphs misleading.

Bonus Write a set of nine numbers that has a mean and median of 5.
VOTING  Refer to the table that shows the number of votes cast for Miguel (M), Aki (A), Tansy (T), and Hannah (H) for best costume.

1. Make a frequency table for the data.

<table>
<thead>
<tr>
<th>Votes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>H</td>
<td>A</td>
</tr>
<tr>
<td>T</td>
<td>A</td>
</tr>
<tr>
<td>T</td>
<td>M</td>
</tr>
</tbody>
</table>

2. Who won second place?

3. Make a vertical bar graph of the data.

4. How does the number of votes for Aki compare to votes for Miguel?

POLLS  Refer to the circle graph that shows the result of an online poll.

5. Which animal is most popular?

6. Which two animals are about equally favored?

7. How do cats compare with monkeys as a favorite animal?

SHOPPING  Refer to the table of book costs.

8. Identify the outlier.

<table>
<thead>
<tr>
<th>Book Costs ($)</th>
<th>1</th>
<th>1</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>33</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

9. Find the mean cost of a book at the store. How does the outlier affect the mean?

10. The store claims the average item costs $1. Which measure of central tendency are they using to describe the data? Is their claim misleading? Explain.
SCHOOL Refer to the table of test scores.

11. Make a stem-and-leaf plot of the data.

<table>
<thead>
<tr>
<th>Test Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>69 95 92 87</td>
</tr>
<tr>
<td>72 87 84 78</td>
</tr>
<tr>
<td>82 80 68 78</td>
</tr>
<tr>
<td>89 78 98 91</td>
</tr>
</tbody>
</table>

12. How many students scored 80 or more on the test?

13. What is the range of the scores?

14. What are the median and mode of the scores?

MONEY Ebony's savings account balance for January through July was $150, $260, $300, $160, $175, $200, and $225, respectively.

15. Draw a line graph of Ebony's savings for the 7 months.

16. Ebony bought a stereo, and her savings decreased that month. In which month did she buy the stereo?

17. Predict Ebony's balance in August. Explain how you made your prediction.

VIDEOS Trent got to choose the video 8 times, and Kayla got to choose 12 times. Refer to the graphs at the right that they made for their mom.

18. Kayla claims her brother chooses the video nearly as often as she. Which graph is Kayla's?

19. Trent claims his sister gets to choose three times more often than he does. Which graph is Trent's?

20. Explain how they made the graphs misleading.

Bonus Write a set of seven numbers that has a mean and median of 4.

B: ______________
SPORTS  Refer to the frequency table.

1. Twenty students went bowling. How many students scored 100–109 points?

2. How many students scored more than 109 points?

3. Did anyone score exactly 110 points?

COMPUTERS  Refer to the circle graph.

4. What total percent of kids used a computer at home?

5. What percent of kids used a computer only at school?

6. What total percent of kids did not use a computer at home?

7. What total percent of kids used a computer?

WEATHER  Refer to the table.

8. Make a bar graph of the data.

9. Find the mean of the data with and without the outlier.

10. What are the mode and median of the data?

11. Which measure of central tendency is most misleading?

SCHOOL  Refer to Luna’s test scores shown in the stem-and-leaf plot.

12. What is the range of her scores?

13. Luna can pick which average the teacher will use for her report card. Which one will Luna pick? Explain.
14. Which year had a decrease in the number of patents granted?

15. Which year had the greatest increase?

16. Make a stem and leaf plot of the data in the table.

<table>
<thead>
<tr>
<th>Average Number of Lunches Cafeteria Served per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

17. The new cook, hired in February, claims lunches served nearly doubled after he was hired. Why is his graph misleading?

18. Redraw the graph so it is not misleading.

19. Write a set of data that has a range of 30, a mode of 68, and a median of 80.

20. Which measure of central tendency best describes the data 1, 1, 1, 2, 7, 7, and 9? Explain.

**Bonus** CODE BREAKING The table shows the frequencies of the letters used in the original message. Decode the secret message XVKKVKKVOOV.

<table>
<thead>
<tr>
<th>Letter</th>
<th>Freq.</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>4</td>
</tr>
<tr>
<td>i</td>
<td>4</td>
</tr>
<tr>
<td>p</td>
<td>2</td>
</tr>
<tr>
<td>m</td>
<td>1</td>
</tr>
</tbody>
</table>

B: ____________________
Demonstrate your knowledge by giving a clear, concise solution to each problem. Be sure to include all relevant drawings and justify your answers. You may show your solution in more than one way or investigate beyond the requirements of the problem. If necessary, record your answer on another piece of paper.

1. Make a frequency table of the data in the table about student grades.

<table>
<thead>
<tr>
<th>Students’ Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
</tbody>
</table>

2. Use your frequency table from Question 1.
   a. Make a bar graph of the data. Be sure to label all the parts of the graph.
   b. Explain how you decided on the scale and interval.
   c. Describe what your graph shows.
   d. How does the number of students with a grade of A compare to the number of students with a grade of D? with a grade of F?
   e. Redo your bar graph so that it is misleading and explain why it is misleading.

3. Use the bicycle sales data in the table.
   a. Make a line graph of the data in the table about bicycle sales. Be sure to label all the parts of the graph.
   b. Describe the scale and interval. Explain how you decided on them.
   c. Explain what your graph shows.
   d. Describe the change in bicycle sales from 1998 to 2002.
   e. Predict how many bicycles will be sold in 2003. Explain how you decided on your prediction.
   f. Redo your line graph so that it is misleading and explain why it is misleading.

<table>
<thead>
<tr>
<th>Bicycle Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>1998</td>
</tr>
<tr>
<td>1999</td>
</tr>
<tr>
<td>2000</td>
</tr>
<tr>
<td>2001</td>
</tr>
<tr>
<td>2002</td>
</tr>
</tbody>
</table>

4. Use the test scores at the right.
   a. Make a stem-and-leaf plot of the data in the table of test scores.
   b. Write a sentence that analyzes the data.
   c. Find the mean, median, mode, and range of the data. Show your work.
   d. Identify any outliers and find the mean without the outliers. Describe how the outlier affects the mean of the data.

<table>
<thead>
<tr>
<th>Scores on a Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>94 72 82 82 86 66</td>
</tr>
<tr>
<td>76 34 98 90 78 92</td>
</tr>
<tr>
<td>68 82 76 76 78 84</td>
</tr>
<tr>
<td>78 88 84 94 82 80</td>
</tr>
</tbody>
</table>
Choose the correct term to complete each sentence.

1. The ________________ is the middle number, or the mean of the middle two numbers, of the ordered data in a set.
2. Pieces of information that are usually numerical are called ________________.
3. A ________________ is a graph that is used to compare parts of a whole.
4. The ________________ separates the scale into equal parts.
5. Extremely high or low values in a data set are called ________________.
6. The ________________ is the number or numbers that occur most frequently in a data set.
7. The interval separates the ________________ into equal parts.
8. A ________________ is a graph used to show how data changes over a period of time.
9. A ________________ displays data that is ordered from least to greatest and is organized by place value.
10. Measure of central tendency is another term for ________________.

In your own words, define each term.
11. statistics

12. mean
For Questions 1–3, refer to the data below.

1. Make a frequency table of the data.

<table>
<thead>
<tr>
<th>Math Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>B B C C A</td>
</tr>
<tr>
<td>A A B C B</td>
</tr>
<tr>
<td>C B C B A</td>
</tr>
<tr>
<td>B B D A B</td>
</tr>
</tbody>
</table>

2. Make a vertical bar graph of the data.

3. Compare the number of students who scored a B to the number who scored an A.

4. What is the best interval for the data set 6, 10, 18, 3, 1, 5, 14, 25, 13, and 23: 1, 5, or 25? Explain your reasoning.

5. Refer to the line graph. Describe the change in sales from April to June.

---

For Questions 4–5, refer to the line graph.

4. Predict the temperature in Denver and Austin for March.

5. How much warmer would you expect it to be in Austin than in Denver during November?
Chapter 2 Quiz
(Lessons 2-7 and 2-8)

1. SCHOOL Make a stem-and-leaf plot for the following test scores: 78, 93, 84, 66, 82, 83, 82, 73, 98, 76, 67, 83, 90, 91, 79, and 76.

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>0 2 5 5</td>
</tr>
<tr>
<td>13</td>
<td>5 9</td>
</tr>
<tr>
<td>14</td>
<td>5 5 9</td>
</tr>
</tbody>
</table>

1. What is the cost of the most expensive bike at the store?

2. How many bikes are less than $140 at the store?

BOOKS Refer to the table of book costs.

<table>
<thead>
<tr>
<th>Book Costs ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 13 7</td>
</tr>
<tr>
<td>9 11 34</td>
</tr>
</tbody>
</table>

4. What is the mean book cost?

5. What is the mean cost without the outlier?

Chapter 2 Quiz
(Lessons 2-5 and 2-6)

1. MULTIPLE-CHOICE TEST ITEM What are the mean, median, and mode of the temperature data 62°, 60°, 70°, 78°, 60°, 66°, respectively?

A. 65°, 62°, 60°
B. 65°, 64°, 60°
C. 66°, 64°, 60°
D. 66°, 62°, 60°

1. ____________

2. REAL ESTATE A real estate company shows that their median house listing is $150,000. Is it possible for them to have a house listed for $1 million? Explain.

2. ____________

3. REAL ESTATE The company shows that their median listing is $150,000. If the range of their listings is $50,000, is it possible for them to have a house listed for $200,000? Explain.

3. ____________

4. Is the median, mode, or mean the most misleading average of 4, 92, 96, and 96? Explain.

4. ____________

5. WEATHER Why is the graph misleading? The bar height for Phoenix should not be more than three times the bar height for Portland.

5. ____________
Chapter 2 Mid-Chapter Test
(Lessons 2-1 through 2-4)

PART I

Write the letter for the correct answer in the blank at the right of each question.

1. Choose the scale that is most appropriate for the data set 2, 18, 9, 7, 13, 22, 4, and 11.
   A. 0 to 50   B. 0 to 30   C. 0 to 20   D. 0 to 10

2. Choose the interval that is best for the data set 212, 180, 90, 17, 413, 522, 64, 344, 150, and 110.
   F. 1   G. 10   H. 100   I. 500

FOOD Refer to the circle graph.

3. What sandwich is the most popular?
   A. tuna   B. peanut butter
   C. bologna   D. cheese

4. Which two sandwiches are equal in popularity?
   F. tuna and bologna   G. cheese and tuna
   H. cheese and bologna   I. tuna and peanut butter

PART II

COLLEGE Refer to the table.

5. Make a line graph of the data.

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>427</td>
</tr>
<tr>
<td>1980</td>
<td>840</td>
</tr>
<tr>
<td>1990</td>
<td>2,159</td>
</tr>
<tr>
<td>2000</td>
<td>3,349</td>
</tr>
</tbody>
</table>

6. Describe the pattern or trend in the college costs from 1970 to 2000.

POPULATION Refer to the bar graph at the right.

7. What two states have about the same wild horse population?

8. How does Wyoming's wild horse population compare with California's?
1. Is 55 prime, composite, or neither? (Lesson 1-3)

2. Write $5 \cdot 5 \cdot 5$ using an exponent. Then find the value of the power. (Lesson 1-4)

Find the value of each expression. (Lesson 1-5)

3. $15 \times \left(6 \div 3\right) + 4$

4. $3^2 + 4 - 4 \times 3$

MOVIES Use the frequency table that shows the ages of children at a movie.

5. How many children at the movie were 10 years or older? (Lesson 2-2)

6. Make a bar graph for the data. (Lesson 2-2)

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>8–9</td>
<td>5</td>
</tr>
<tr>
<td>10–11</td>
<td>10</td>
</tr>
<tr>
<td>12–13</td>
<td>6</td>
</tr>
</tbody>
</table>

7. Name one way to make your bar graph misleading. (Lesson 2-8)

SCHOOL Use Lin’s first six test scores of 58, 58, 63, 69, 74, and 80.

8. Make a line graph for the data. (Lesson 2-2)

9. What is a good prediction for Lin’s seventh test score? (Lesson 2-4)

10. Find the mean test score. (Lesson 2-6)

11. Find the mode, median, and range of the test scores. (Lesson 2-7)

12. Which measure of central tendency is most misleading for the test scores? Why? (Lesson 2-8)
Part 1: Multiple Choice

Instructions: Fill in the appropriate oval for the best answer.

1. Evaluate $3 \times 1 + 7 \times 9$. (Lesson 1-5)
   A. 192     B. 216     C. 90     D. 66
   1.  A  B  C  D

2. Evaluate $2r$ if $r = 37$. (Lesson 1-6)
   F. 64     G. 74     H. 39     I. 35
   2.  F  G  H  I

3. What is the area of a rectangle that is 12 inches wide and 13 inches long? (Lesson 1-8)
   A. 157 in²  B. 25 in²  C. 156 in²  D. 50 in²
   3.  A  B  C  D

4. Use the frequency table. If twenty-five students took the test, how many scored 61–70 points? (Lesson 2-1)
   Score | Frequency
   ------|---------
   61–70 | ?
   71–80 | 4
   81–90 | 12
   91–100| 8
   4.  F  G  H  I

5. What are the stems in a stem-and-leaf plot for the data 5, 10, 14, 26, and 34? (Lesson 2-5)
   A. 0, 4, 5, 5, 6  B. 0, 1, 2, 3  C. 1, 2, 3  D. 0, 4, 5, 6
   5.  A  B  C  D

6. Sasha is buying a new stereo. The range in prices for the stereos she likes is $170. If the most expensive one she likes is $310, how much is the least expensive? (Lesson 2-7)
   F. $160  G. $140  H. $480  I. $240
   6.  F  G  H  I

7. What is the missing value in the circle graph corresponding to the percent of people who favor plums? (Lesson 2-3)
   A. 10%  B. 20%  C. 22%  D. 12%
   7.  A  B  C  D

8. Which data set has a mode of 4? (Lesson 2-7)
   F. {1, 2, 3, 4}  G. {3, 4, 6}
   H. {4, 4, 5, 5, 5}  I. {4, 4, 5}
   8.  F  G  H  I

9. At a small video store, a clerk counts the number of tapes rented each hour. The first seven hours the store rents 6, 3, 7, 6, 8, 51, and 10 tapes. Which measure of central tendency is most misleading for the data? (Lesson 2-8)
   A. mode  B. median  C. mean  D. scale
   9.  A  B  C  D
10. Tim practiced playing the oboe for 9 minutes on Monday, 13 minutes on Tuesday, and 17 minutes on Wednesday. If he continues to practice in the same pattern, how many minutes will he practice on Thursday? (Lesson 1-1)

11. Write $8^3$ as a product. Then find the value of the power. (Lesson 1-4)

12. The bar graph shows how much each grade raised in the recycling drive. Which grade raised about twice as much money as the 7th graders? (Lesson 2-2)

13. A store stocks four brands of jeans that cost $18, $20, $24, and $34. What is the mean cost of jeans at the store? (Lesson 2-6)

14. The line graph at the right shows the height of Jack's tree at the end of each month.
   a. How tall was tree at the end of the third month? (Lesson 2-2)
   b. When was the tree about 18 centimeters tall? (Lesson 2-2)
   c. One month, Jack trimmed his tree back slightly. Which month was this? (Lesson 2-2)
   d. Predict when the tree will reach a height of 26 centimeters. Explain how you made your prediction. (Lesson 2-4)
1. **SWIMMING** Charmaine swam 2 laps on Monday, 3 laps on Tuesday, 5 laps on Wednesday, and 8 laps on Thursday. If the pattern continues, how many laps will she swim on Friday?

2. Which of these numbers is 796 divisible by? 2, 3, 4, 5, 6, 9, 10
   Now classify 796 as **even** or **odd**.

Tell whether each number is **prime**, **composite**, or **neither**.

3. 19
4. 28

Find the prime factorization of each number.

5. 63
6. 36

Write each product using an exponent. Then find the value of the power.

7. $6 \cdot 6$
8. $1 \cdot 1 \cdot 1 \cdot 1 \cdot 1$

Find the value of each expression.

9. $8 + 6 ÷ 2$
10. $10 ÷ 2 + (4^2 - 6)$

Evaluate each expression if $a = 7$ and $b = 2$.

11. $b + 3$
12. $a^2 - 4b$

For Questions 13 and 14, solve each equation mentally.

13. $m + 3 = 19$
14. $11 = 25 - h$

15. **AREA** A textbook cover measures 18 centimeters by 24 centimeters. What is the area of the cover of the textbook?

**SCHOOL** Refer to the table.

16. Make a frequency table for the data.

<table>
<thead>
<tr>
<th>Math Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B A B</td>
</tr>
<tr>
<td>C B B A</td>
</tr>
<tr>
<td>B A A A</td>
</tr>
<tr>
<td>B C B B</td>
</tr>
<tr>
<td>C A B B</td>
</tr>
</tbody>
</table>

17. Which score is most common?

18. Make a vertical bar graph of the data.
19. Compare the number of students that scored a B to the number that scored a C.

20. Name one way to make your bar graph misleading.

MONEY Eva’s savings account balance was $200, $120, $135, $160, and $180 for April through August, respectively.

21. Draw a line graph of Eva’s savings for the 5 months.

22. In which month did Eva’s savings decrease as compared to the savings in the month before?

23. Predict Eva’s balance in October.

POLLS Refer to the circle graph. How Do You Get to School?

24. How do most students get to school?

25. Compare the number of students that ride the bus to the number that ride with a parent.

READING Refer to the table.

Books Read in a Month

<table>
<thead>
<tr>
<th>Books Read in a Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

26. What is the mean of the data?

27. Which value is the outlier?

28. What is the mean without the outlier?

29. What is the median number of books read?

30. What is the mode of the data?

31. What is the range of the data?

32. Does the mean, mode, or median best describe the average number of books read? Explain.
Standardized Test Practice

Student Recording Sheet (Use with pages 94–95 of the Student Edition.)

Part 1: Multiple Choice
Select the best answer from the choices given and fill in the corresponding oval.

1. A B C D
2. F G H I
3. A B C D
4. F G H I
5. A B C D

Part 2: Short Response/Grid in
Solve the problem and write your answer in the blank.

For grid in questions, also enter your answer by writing each number or symbol in a box. Then fill in the corresponding circle for that number or symbol.

7. ____________
8. ____________
9. ____________
10. ____________
11. ____________
12. ____________ (grid in)

Part 3: Extended Response
Record your answers for Questions 14 and 15 on the back of this paper.
Standardized Test Practice

**Rubrics** (Use to score the Extended Response questions on page 95 of the Student Edition.)

**General Scoring Guidelines**

- If a student gives only a correct numerical answer to a problem but does not show how he or she arrived at the answer, the student will be awarded only 1 credit. All extended response questions require the student to show work.
- A fully correct answer for a multiple-part question requires correct responses for all parts of the question. For example, if a question has three parts, the correct response to one or two parts of the question that required work to be shown is not considered a fully correct response.
- Students who use trial and error to solve a problem must show their method. Merely showing that the answer checks or is correct is not considered a complete response for full credit.

**Exercise 14 Rubric**

<table>
<thead>
<tr>
<th>Score</th>
<th>Specific Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>A prediction of about 11.3 s is given. An explanation of how the prediction was made is accurate and complete.</td>
</tr>
<tr>
<td>3</td>
<td>The prediction is correct. However, the explanation is correct but not complete.</td>
</tr>
<tr>
<td>2</td>
<td>The explanation is correct, but the prediction is not as accurate as possible.</td>
</tr>
<tr>
<td>1</td>
<td>The prediction is correct, but the explanation is incorrect or not given.</td>
</tr>
<tr>
<td>0</td>
<td>Response is completely incorrect.</td>
</tr>
</tbody>
</table>

**Exercise 15 Rubric**

<table>
<thead>
<tr>
<th>Score</th>
<th>Specific Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>An explanation of how the heights are misrepresented is accurate and complete. An explanation of how to change the graph to make it less misleading is accurate and complete.</td>
</tr>
<tr>
<td>3</td>
<td>Both explanations are correct, but one explanation is not complete.</td>
</tr>
<tr>
<td>2</td>
<td>Both explanations are correct, but neither is complete.</td>
</tr>
<tr>
<td>1</td>
<td>Only one explanation is correct.</td>
</tr>
<tr>
<td>0</td>
<td>Response is completely incorrect.</td>
</tr>
</tbody>
</table>
2-1

Study Guide and Intervention
Frequency Tables

Statistics involves collecting, organizing, analyzing, and presenting data. Data are pieces of information and are usually numbers. You can organize data by making a frequency table. A frequency table shows the number of times each piece of data appears.

The parts of a frequency table:
- Scale: lets you record all of the data; includes the least and the greatest number
- Interval: separates the scale into equal parts
- Tally marks: lets you record a mark each time a piece of data appears
- Frequency: gives the sum of the tally marks for each category

EXAMPLE 1
SCHOOL Vinnie recorded his scores on this month’s math quizzes. Make a frequency table of the data. Which score did Vinnie get most often?

Step 1 Choose a scale and interval. A scale that includes all the data is 0 to 10. An interval that separates the scale into equal parts is 2.

Step 2 Draw a table with three columns and label the columns.

Step 3 List the intervals, tally the data, and add the tallies.

Since the quiz score 9 has the greatest number in the frequency column, Vinnie scored 9 most often.

EXERCISES

MUSIC: Use the table that shows the number of hours the band members practiced in a week.

1. Make a frequency table for the data.

2. Which number of hours practicing is most common? 3 h

3. How many band members practiced more than 4 hours a week? 2

Answers

1. My Quiz Scores

<table>
<thead>
<tr>
<th>Score</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3-4</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>5-6</td>
<td>///</td>
<td>3</td>
</tr>
<tr>
<td>7-8</td>
<td>///</td>
<td>2</td>
</tr>
<tr>
<td>9-10</td>
<td>///</td>
<td>5</td>
</tr>
</tbody>
</table>

MOVIES: Use the frequency table shown.

3. Describe the scale. The scale is from $100 million to $349 million.

4. Describe the interval. The interval is $50 million.

5. What is the most common gross sales category? $100-$149 million

6. How many films grossed more than $299 million? 2
### Practice: Word Problems

**Frequency Tables**

**ANIMALS** For Exercises 1–3, use Table A. For Exercises 4–6, use Table B.

#### Table A

<table>
<thead>
<tr>
<th>Insects Under a Rock</th>
<th>Weights (lb) of Dogs at the Vet Clinic</th>
</tr>
</thead>
<tbody>
<tr>
<td>E S B E E B E E S E E</td>
<td>Weight</td>
</tr>
<tr>
<td>S E E B E S E E S E E</td>
<td>1–10</td>
</tr>
<tr>
<td>B E E E B E E S E E</td>
<td>11–20</td>
</tr>
<tr>
<td>B E E E S E E S E E</td>
<td>21–30</td>
</tr>
<tr>
<td>B E E E S E E S E E</td>
<td>31–40</td>
</tr>
<tr>
<td>B E E E S E E S E E</td>
<td>41–50</td>
</tr>
</tbody>
</table>

**B** = beetle  **E** = earwig  **S** = sow bug

1. Maria is counting three types of insects she finds under rocks in the park for an ecology survey. Make a frequency table showing her data from Table A.

   **Sample answer:**
   - **Insects Under a Rock**
   - **Insect**  | **Tally**  | **Frequency**
   - **Beetle**  | 53         | 8
   - **Earwig**  | 5553       | 18
   - **Sow bug** | 55         | 10

2. How many more earwigs did Maria find than beetles? **10 earwigs**

3. When Maria writes her report, she will list the insects in order of most common to least common. What order should she write in her report?
   - **earwig, sow bug, beetle**

4. The strength of medicine given to a dog depends on the dog’s weight. There is a different strength for each weight group. For which weight group should a veterinarian order the most medicine? the least medicine?
   - **least medicine:** 21–30 lb; 41–50 lb

5. Describe the scale and the interval in Table B. **The scale is 1 to 50, and the interval is 10.**

6. How many more dogs are in the most frequent group than in the second most frequent group? **6 dogs**

### Reading to Learn Mathematics

**Frequency Tables**

**Pre-Activity** Complete the activity at the top of page 50 in your textbook. Write your answers below.

1. What is the height of the tallest tree? **135 ft**
2. How many trees are between 41 and 80 feet tall? **13**
3. Tell how you might organize the heights of the trees so that the information is easier to find and read. **Sample answer: Arrange the heights from least to greatest.**

**Reading the Lesson**

Refer to the frequency table in the middle of page 50.

4. What does the number 13 in the **Frequency** column indicate? the number of times a number between 51 and 80 occurs in the data set

5. Does the number in the **Frequency** column tell you anything about the frequency of individual numbers within the data set? How do you know? **No; looking through the data set, you can see that some numbers appear more than once (for example, the number 72).**

6. How is frequency related to interval? The frequency tells the number of times a number within an interval occurs in a data set.

7. Why do the numbers in the **Height** column begin at 51 and end at 140? **because all the data must be included and because the groupings of data (the intervals) must be equal (in this case, 30 numbers in each group)**

8. How does an interval make it easier to read the table? **Sample answer: An interval groups the data in the data set into subsets, so that you can analyze the data quickly.**

**Helping You Remember**

9. Write the three steps used to make a frequency table. Then, using any data set you want, make a frequency table for those numbers.
   1) Choose an appropriate scale and interval for the data.
   2) Draw a table with three columns and label the columns.
   3) In the first column, list the intervals. In the second column, tally the data. In the third column, add the tallies. For the sample frequency table, see students’ work.
### 2-1 Enrichment

**Histograms**

Often a graph is used to picture the data in a frequency table. When frequencies are pictured in a bar graph, the graph is called a **histogram**. For example, at the right is a histogram that pictures the frequencies of the scores on a math test. Each bar in a histogram shows the number of pieces of data in a certain interval.

Use the histogram at the right to answer each question.

1. How many scores are in the interval 81–90? 5

2. In which interval(s) are there exactly three scores? 41–50 and 91–100

3. How many scores are 70 or less? 9

4. Suppose that, to pass this test, a student needed a score of 61 or higher. How many students passed the test? 20

5. Can you tell in which interval there is the greatest number of scores? Explain. Yes; the bar for the interval 71–80 is the highest.

6. Can you tell what was the highest score on the test? Explain. No; you only know it was somewhere between 91 and 100.

7. Use the histogram at the right. In the space below, write two questions about the data in the histogram. Then answer each question. **See students’ work.**

---

### 2-2 Study Guide and Intervention

**Bar Graphs and Line Graphs**

A **graph** is a visual way to display data. A **bar graph** is used to compare data. A **line graph** is used to show how data changes over a period of time.

**Example 1**

Make a bar graph of the data. Compare the number of students in jazz class with the number in ballet class.

- **Step 1** Decide on the scale and interval.
- **Step 2** Label the horizontal and vertical axes.
- **Step 3** Draw bars for each style.
- **Step 4** Label the graph with a title.

About twice as many students take ballet as take jazz.

**Example 2**

Make a line graph of the data. Then describe the change in Gwen’s allowance from 1998 to 2002.

- **Step 1** Decide on the scale and interval.
- **Step 2** Label the horizontal and vertical axes.
- **Step 3** Draw and connect the points for each year.
- **Step 4** Label the graph with a title.

Gwen’s allowance did not change from 1998 to 1999 and then increased from 1999 to 2002.

**Exercises**

Make the graph listed for each set of data.

1. **bar graph** See students’ work.
2. **line graph** See students’ work.

### Problems

#### Bar Graphs

- **Riding the Bus**
  - Paula: 10 min
  - Omar: 40 min
  - Ulani: 20 min
  - Jacob: 15 min
  - Amita: 35 min

- **Getting Ready for School**
  - Monday: 34 min
  - Tuesday: 30 min
  - Wednesday: 37 min
  - Thursday: 20 min
  - Friday: 25 min
Practice: Word Problems

Bar Graphs and Line Graphs

For Exercises 1, 3, and 4, use Table A. For Exercises 2, 5, and 6, use Table B.

Table A

<table>
<thead>
<tr>
<th>Average Heights of Pine Trees</th>
<th>Tree</th>
<th>Height (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern White</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Lodgepole</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Longleaf</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>Pitch</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Ponderosa</td>
<td>140</td>
<td></td>
</tr>
</tbody>
</table>

Table B

<table>
<thead>
<tr>
<th>Lemons Produced by My Tree</th>
<th>Year</th>
<th>Number of Lemons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1999</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>122</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>55</td>
</tr>
</tbody>
</table>

1. You and Jorge are writing a report on different kinds of pine trees. Make a bar graph for the report that shows the average heights of different kinds of pine trees. Use the data from Table A.

Sample answer:

```
<table>
<thead>
<tr>
<th>Height (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
</tr>
<tr>
<td>48</td>
</tr>
<tr>
<td>110</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>140</td>
</tr>
</tbody>
</table>
```

2. Table B shows the number of lemons your tree produced each year. Make a line graph for the data in Table B.

Sample answer:

```
<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Lemons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>26</td>
</tr>
<tr>
<td>2000</td>
<td>124</td>
</tr>
<tr>
<td>2001</td>
<td>122</td>
</tr>
<tr>
<td>2002</td>
<td>78</td>
</tr>
<tr>
<td>2003</td>
<td>55</td>
</tr>
</tbody>
</table>
```

3. Use your graph for Exercise 1. Which tree is about half as tall as a ponderosa? **Eastern White Pine**

4. How does the average height of a pitch pine compare to the average height of a lodgepole pine? **A Pitch Pine is slightly taller than a Lodgepole Pine.**

5. Use the line graph you made in Exercise 2. Describe the change in fruit production for your lemon tree.

Sample answer: The number of fruit increased sharply in 2000, stayed about the same in 2001, sharply decreased in 2002, and decreased a little in 2003.

6. FRUIT Suppose you want to make a graph of the total number of lemons produced by your lemon tree and the total number of oranges produced by your orange tree in one year. Would you make a bar graph or a line graph? Explain. **A line graph is used to show changes over time.**
2-2 Reading to Learn Mathematics

Bar Graphs and Line Graphs

Pre-Activity  Complete the activity at the top of page 56 in your textbook. Write your answers below.

1. What type of roller coaster is most common?  steel

2. What might be an advantage of organizing data in a table? Are there any disadvantages of organizing data in this way?  Sample answer: An advantage of organizing data in a table is that you can find exact values for each type of coaster. A disadvantage may be that a table is not as visual as a graph.

Reading the Lesson

Compare the frequency table at the top of page 56 with the bar graph in the middle of the same page.

3. How are they similar?  Sample answer: Both represent the frequency of six types of roller coasters found in the United States.

4. How are they different?  Sample answer: The frequency table uses numbers. The bar graph translates the numbers into bars of varying heights.

5. For purposes of comparison, which do you find easier to use to compare differences among frequencies—the frequency table or the bar graph? Explain.  Sample answer: The bar graph; it is easier to see at a glance that the frequency of the steel roller coaster is far greater than the frequency of any of the other types of roller coaster in the data set.

Refer to the line graph at the bottom of page 56.

6. Represent the same data in a table that uses only numbers.  Sample answer:

7. Compare the table you just created with the line graph. Which do you think presents the data in a way that is easier to compare changes over periods of time? Explain.  Sample answer: The line graph; it is easier to see at a glance how the frequency of wooden roller coasters changed over intervals of time.

Helping You Remember

8. Explain how the information in a line graph differs from the information in a bar graph.  Sample answer: Line graphs show how information changes over time. Bar graphs are used to compare data.

Line Plots

In a line plot, data are pictured on a number line. An ✗

is used to represent each item of data. For example, the figure below is a line plot that pictures data about the number of CDs owned by the students in a math class.

Use the line plot above to answer each question.

1. How many students own exactly eighteen CDs?  2

2. What number of CDs is owned by exactly three students?  11

3. A data item that is far apart from the rest of the data is called an outlier. Is there an outlier among these data? What is it?  yes; 34

4. What would you say is the number of CDs owned by the “typical” student in this class?  Sample answer: 7 – 13 tapes

5. Use the data in the table to complete the line plot below. Four data points have been graphed for you.

<table>
<thead>
<tr>
<th>Number of Seconds for 24 Sixth-Graders to Run 200 Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 80 90 100 110 120 130 140 150</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>8</td>
</tr>
<tr>
<td>1950</td>
<td>16</td>
</tr>
<tr>
<td>1975</td>
<td>19</td>
</tr>
<tr>
<td>2000</td>
<td>75</td>
</tr>
</tbody>
</table>
2-3 Study Guide and Intervention
Circle Graphs

A circle graph is used to compare parts of a whole. The pie-shaped sections show the groups. The percents add up to 100%.

EXAMPLES

1. SCHOOL The circle graph shows the subjects Mike studies during homework time. Which subject does Mike spend most of his time studying?
The largest section of the graph is the section representing math. So, math takes up the most time.

2. How does the time spent studying social studies compare to the time spent studying science?
The section representing social studies is about twice the size of the section representing science. So, twice as much time is spent on social studies as on science.

SURVEYS Use the graph that shows the results of a favorite colors survey.

1. Which color is the least favorite? purple
2. Which colors are the favorites of the same number of people? orange and yellow
3. How does the number of people who say green is their favorite color compare to the number who say yellow is their favorite color? Almost twice as many people say green as say yellow.

FOOD Use the graph of Mike’s study time from the Examples.

4. Which subject does Mike spend the least time studying? music
5. On which two subjects together does Mike spend about the same time as reading? social studies and science
6. How does the amount of time spent on math compare to the amount of time Mike spends on science? Eight times as much time is spent on math.

2-3 Practice: Skills
Circle Graphs

GEOGRAPHY Use the graph that shows how much of Earth’s land that each continent represents.

1. Which continent has the greatest area? Asia
2. Which two continents are the smallest? Australia and Europe
3. How does the size of Europe compare to the size of Africa? Europe is smaller than Africa.
4. How much larger is Asia than Africa? Asia is one and a half times as large as Africa.

LAKES Use the graph that shows how much of the total surface of the Great Lakes each lake takes up.

5. Which of the Great Lakes is the smallest? Lake Ontario
6. Which two lakes are about the same size? Lake Michigan and Lake Huron
7. How does Lake Erie compare to Lake Ontario? Lake Erie is slightly larger than Lake Ontario.
8. Which two lakes together are the same size as Lake Superior? Lake Erie and Lake Michigan, or Lake Erie and Lake Huron

VACATIONS Use the graph that shows how families will spend winter vacation.

9. How will most families spend their vacations? visiting family
10. Will more families go to the beach or go shopping? go shopping
11. Compare how many families will be skiing to how many will be visiting family. About three times as many families will be visiting family as will be skiing.
**Pre-Activity**

Complete the Mini Lab at the top of page 62 in your textbook. Write your answers below.

1. Make a bar graph of the data.

2. Which graph represents the data better, a circle graph or a bar graph? Explain. **Sample answer:** The circle graph best represents the data as you can see how each category compares to the whole.

**Reading the Lesson**

3. A circle graph compares parts of a whole. How is a circle well suited for this kind of representation? **Sample answer:** The circle is a whole. Each section of the circle is a part of the whole. Differences in size between one section and another are very easy to recognize visually.

4. At the bottom of page 62, the text says that the percents add up to 100%. Why is this important? **Sample answer:** It is important that the percents add up to 100% because 100% means that the whole circle is filled and all data are represented.

**Helping You Remember**

5. Find a circle graph in a newspaper or magazine. Explain to a classmate what the sections of the graph represent. **See students’ work.**
A Circle Graph Mystery

The circle graph below was drawn to show the leading causes of fire in the United States. However, all the labels except one have mysteriously disappeared.

Use the clues below to decide what the labels should be and where they belong. Then complete the graph. (Remember: Each label must include a word or phrase and a percent.)

Clue 1  Most fires are caused by heating equipment.
Clue 2  Fires caused by electrical wiring and fires caused by heating equipment together make up 46% of all fires.
Clue 3  The percent of fires caused by children playing is 12% less than the percent of fires caused by cooking.
Clue 4  The percent of fires caused by open flames is equal to the percent of fires caused by children playing.
Clue 5  The percent of the fires caused by cooking and the percent of fires caused by arson are together just 1% less than the percent of fires caused by heating equipment.
Clue 6  The percent of the fires caused by electrical wiring is 15% greater than the percent caused by children playing.
Clue 7  Fires caused by smoking and fires caused by arson together make up 17% of all fires.
Clue 8  Fires that result from other causes are listed in a category called other.

Because they show trends over time, line graphs are often used to predict future events.

Example 1

The graph shows the time Ruben spends each day practicing piano scales. Predict how much time he will spend practicing his scales on Friday.

Continue the graph with a dotted line in the same direction until you reach a vertical position for Friday.

By extending the graph, you see that Ruben will probably spend half an hour practicing piano scales on Friday.

Exercises

MONEY Use the graph that shows the price of a ticket to a local high school football game over the last few years.

1. Has the price been increasing or decreasing? Explain. Increasing; the graph rises as it goes from left to right.
2. Predict the price of a ticket in year 6 if the trend continues. about $7.00
3. In what year do you think the price will reach $9.00 if the trend continues? around year 8

BANKS Use the graph that shows the interest rate for a savings account over the last few years.

4. What does the graph tell you about interest rates? They are decreasing.
5. If the trend continues, when will the interest rate reach 1 percent? about year 7
Practice: Word Problems
Making Predictions
FITNESS For Exercises 1–3, use Graph A. For Exercises 4–6, use Graph B.

Graph A

Graph B

1. Refer to Graph A. Describe the change in the number of students taking the aerobics class. Sample answer: There was a sharp decrease in the number of students in weeks 2 and 3. There was a slight decrease in week 4. Then the number of students remained constant in week 5.

2. Predict how many students will be in the aerobics class in week 6 if the trend continues. Sample answer: 7 students

3. Predict how many students will be in the aerobics class in week 8. Sample answer: 7 students

4. Describe the change in the number of sit-ups Cara can do. Sample answer: The number of sit-ups increased steadily over the 5 weeks.

5. Predict how many sit-ups Cara will be able to do in week 6 if the trend continues. Sample answer: 65 sit-ups

6. Predict the week in which Cara will be able to do 80 sit-ups if the trend continues. Sample answer: week 7

INTERNET Use the graph that shows Internet users in the United States.

1. Describe the change in active Internet users from April 2000 to April 2001. Sample answer: The number of active Internet users increased.

2. Predict how many active users there were in October 2001 if the trend continued. Sample answer: about 110 million users

3. Predict when the number of active users exceeded 115 million if the trend continued. Sample answer: by April 2002

4. Were there more active users in January 2002 or October 2001? Explain. Sample answer: Most likely in January 2002; the number of active users had been increasing since April 2000.

SPORTS Use the graph that shows the winning times of the 10K Biathlon rounded to the nearest minute.

5. How did the winning time change from 1980 to 2002? Sample answer: It decreased slightly from 1980 to 1984, and then decreased sharply from 1984 to 1988. Next it increased until 1994; and then decreased.

6. To the nearest minute, by how much did the winning time change from 1980 to 2002? 7 minutes

7. Predict the winning time for 2006 if the trend continues. The winning time will be about 23 minutes.

8. Predict when the winning time will be less than 20 minutes if the trend continues. It will occur around 2014.
Graphs and Decision Making

Just as important as knowing how to make a bar graph or a line graph is deciding what type of graph to use. Here are some guidelines to help you make that decision.

- A bar graph compares data that fall into distinct categories.
  - Example Use a bar graph to show how the populations of several cities compare in one year.

- A line graph shows changes in data over a period of time.
  - Example Use a line graph to show how the population of one city changed over several years.

Would you use a bar graph or a line graph to show these data?

1. average temperatures in Sacramento for each month of the year
   - line graph

2. average temperatures in January in five California cities
   - bar graph

3. land area of the continents
   - bar graph

4. number of CD players purchased each year from 1981 through 1990
   - line graph

5. weight of a baby in each month from birth to one year of age
   - line graph

6. heights of the world’s five tallest trees
   - bar graph

Make an appropriate graph for each set of data.

7. Cars in Use
   - Year | Number (millions)
   - 1970 | 80
   - 1980 | 105
   - 1990 | 124
   - 2000 | 136

8. Seating Capacity of Aircraft
   - Model | Number of Seats
   - B747 | 405
   - DC-10 | 288
   - L-1011 | 296
   - MD-80 | 142

Pre-Activity Complete the activity at the top of page 66 in your textbook. Write your answers below.

1. Describe the trends in the winning amounts. The winning amounts increase slowly until 1996, when there was a large jump. For the next 4 years the amounts increased $50,000 to $100,000 each year.

2. Make a prediction as to the amount of money the winner of the 2005 Daytona 500 will receive. $1,600,000

Reading the Lesson

Refer to the sentence just below the activity at the top of page 66: “Line graphs are often used to predict future events because they show trends over time.”

3. The word predict comes from two Latin words that mean “to tell in advance.” Look up the word predict in a dictionary. What meaning is given for the word? Sample answer: To declare or indicate in advance; to foretell.

4. Look up the word trend in a dictionary. What meaning is given for the word as it is used in the definition of line graph? Sample answer: The general movement in the course of time of a statistically detectable change; tendency.

5. Look at the line graph at the bottom of page 66. In terms of trend, what happened between 1997 and 1998? What is the difference between prediction and data or statistics? Sample answer: Between 1997 and 1998, there was a sharp increase in money awarded the winner of the Daytona 500. The increase was far above the trend indicated by data prior to 1997; Data or statistics are real, are actual, and are based on observation and analysis. Prediction is merely a guess at what might happen in the future.

Helping You Remember

6. Find two line graphs, one where you feel you can predict the future with confidence and one where you cannot. Explain the difference. Sample answer: The difference will lie in the pattern or trend of data in the graph. If the trend is obvious and repeats with consistency, future events are more predictable than if the graph does not show any repeatable patterns or general trend.
Make a stem-and-leaf plot for each set of data.

1. 18, 16, 13, 20, 33, 58, 32, 14, 61, 67, 52

2. 61, 75, 62, 63, 74, 71, 75, 82, 64, 81, 91, 65

3. $52, $49, $37, $21, $65, $23, $49, $51

4. 82°, 91°, 80°, 55°, 63°, 54°, 83°, 90°, 84°, 91°, 59°, 62°, 50°, 92°, 85°, 92°, 92°

For Exercises 5–8, use the stem-and-leaf plot that shows the total number of points earned by each volleyball team at a tournament.

5. What was the greatest number of points earned? 65 points

6. What was the least number of points earned? 29 points

7. How many teams earned more than 50 points? 6 teams

8. Between what numbers are most of the points earned? between 36 and 49
2-5 Practice: Word Problems

Stem-and-Leaf Plots

TRAFFIC For Exercises 1 and 2, use the table. For Exercises 3 and 4, use the stem-and-leaf plot.

<table>
<thead>
<tr>
<th>Number of Trucks Passing Through the Intersection Each Hour</th>
<th>Number of Birds at a Watering Hole Each Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 15 6 42 34 28</td>
<td>Stem</td>
</tr>
<tr>
<td>19 18 19 22 23 21</td>
<td>1</td>
</tr>
<tr>
<td>32 26 34 19 29 21</td>
<td>2</td>
</tr>
<tr>
<td>10 6 8 40 14 17</td>
<td>3</td>
</tr>
<tr>
<td>7 10 20 28</td>
<td>4</td>
</tr>
<tr>
<td>5 0 0 3 4 6 6 7</td>
<td>5</td>
</tr>
<tr>
<td>3 4 = 34 birds</td>
<td></td>
</tr>
</tbody>
</table>

1. Mr. Chin did a traffic survey. He wrote down the number of trucks that passed through an intersection each hour. Make a stem-and-leaf plot of his data.

2. Refer to your stem-and-leaf plot from Exercise 1. Mr. Chin needs to know the range of trucks passing through the intersection in one hour into which the greatest number of hours fall. 10-20 trucks

3. What is the least number of birds at the watering hole in one hour? What is the greatest number? 18 birds; 57 birds

4. What is the most frequent number of birds to be at the watering hole in one hour? 45 birds

5. RVs Make a stem-and-leaf plot for the number of RVs Mr. Chin counted in 12 hours: 3, 4, 9, 13, 7, 9, 8, 5, 4, 6, 1, 11.

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1 3 4 4 5 6 7 8 9 9</td>
</tr>
<tr>
<td>1</td>
<td>1 3</td>
</tr>
<tr>
<td>1/3 = RVs</td>
<td></td>
</tr>
</tbody>
</table>

6. RVs Write a few sentences that analyze the RV data for Mr. Chin’s report in Exercise 5. The least number of RVs in one hour was 1, and the greatest number was 13. The most frequent numbers were 4 and 9.

Helping You Remember

7. Write the steps for making a stem-and-leaf plot. Show someone what a stem-and-leaf plot is, how to read one, and how to make one. See students’ work; Sample answer: 1) Order the data from least to greatest. 2) Draw a vertical line and write the stems to the left of the line in order from least to greatest. 3) Record the leaves for each stem, left to right from least to greatest. 4) Write a key that explains the stems and leaves.
2-5 Enrichment

A back-to-back stem-and-leaf plot is used to compare two sets of data. In this type of plot, the leaves for one set of data are on one side of the stems, and the leaves for the other set of data are on the other side of the stems. Two keys to the data are needed.

ELECTIONS Use the back-to-back stem-and-leaf plot of the electoral votes cast by each state and the District of Columbia for the Democratic and Republican candidates for U.S. president in 2000.

<table>
<thead>
<tr>
<th>Democrat</th>
<th>Stem</th>
<th>Republican</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 3 4 4 4 5 7 8</td>
<td>0 0 1 1 2 5 8</td>
<td>1 1 2 3 3 4</td>
</tr>
<tr>
<td>6 7 8 8 8 8 8 9 9</td>
<td>2 0</td>
<td>2 votes</td>
</tr>
</tbody>
</table>

1. What is the greatest number of electoral votes cast by a state for the Democratic candidate? the greatest number of electoral votes cast by a state for the Republican candidate?

54; 32

2. Which candidate received votes from the greater number of states?
   the Republican candidate

3. Which candidate received the greater number of total votes?
   the Republican candidate

4. What is the difference between the number electoral votes cast for the candidates?
   5 votes

5. Write a sentence or two comparing the number of electoral votes cast for the two candidates. Sample answer: The Republican candidate received more votes in total. The votes for the Republican candidate came from more states, but from many states with fewer votes to cast than the states that cast their votes for the Democratic candidate.

2-6 Study Guide and Intervention

Mean

The mean is the most common measure of central tendency. It is an average, so it describes all of the data in a data set.

**Example 1** The prices of twelve different jackets are shown. Find the mean.

\[
\text{mean} = \frac{25 + 34 + 39 + \ldots + 27}{12}
\]

\[
= \frac{444}{12} = 37
\]

The mean price of a jacket is $37.

**Example 2** Find the mean for the snowfall data with and without the outlier. Then tell how the outlier affects the mean of the data.

Compared to the other values, 4 inches is low. So, it is an outlier.

\[
\begin{align*}
\text{mean with outlier} & = \frac{20 + 19 + 20 + 17 + 4}{5} \\
& = \frac{80}{5} = 16
\end{align*}
\]

\[
\begin{align*}
\text{mean without outlier} & = \frac{20 + 19 + 20 + 17}{4} \\
& = \frac{76}{4} = 19
\end{align*}
\]

With the outlier, the mean is less than the values of most of the data. Without the outlier, the mean is close in value to the data.

**Exercises**

Find the mean for each set of data.

1. 11, 8, 7, 12, 10, 9, 13, 26 **12**

2. 15, 10, 9, 17, 24, 27, 39, 15, 24 **20**

3. 26, 19, 29, 15, 2, 31, 56, 30 **26**

4. 108, 121, 73, 79, 56, 91 **88**

5. Find the mean for the set of data in Exercise 1 without the outlier. Then tell how the outlier affects the mean of the data. **10**; The mean is greater than most of the data with the outlier. Without the outlier, the mean is close in value to the data.
### Practice: Skills

**Mean**

Find the mean for each set of data.

1. 6, 9, 2, 4, 3, 6, 5
2. 25, 18, 14, 27, 25, 14, 18, 25, 23
3. 13, 6, 7, 13, 6
4. 8, 2, 9, 4, 6, 8, 5
5. 13, 7, 17, 19, 7, 15, 11, 7
6. 1, 15, 9, 12, 18, 9, 5, 14, 7
7. 28, 32, 23, 43, 32, 27, 21, 34
8. 30, 16, 29, 32, 14, 21, 26
9. 42, 35, 27, 42, 38, 35, 29, 24
10. 157, 124, 157, 124, 157, 139

Identify the outlier or outliers in each set of data.

11. $40$ 12. $57$

**WEATHER** Use the data in the table that shows daily temperatures.

<table>
<thead>
<tr>
<th>Day</th>
<th>Temp. (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>69</td>
</tr>
<tr>
<td>Tuesday</td>
<td>70</td>
</tr>
<tr>
<td>Wednesday</td>
<td>73</td>
</tr>
<tr>
<td>Thursday</td>
<td>35</td>
</tr>
<tr>
<td>Friday</td>
<td>48</td>
</tr>
</tbody>
</table>

13. Identify the outlier: 35°

14. What is the mean of the data with the outlier included? 63°

15. What is the mean of the data without the outlier included? 70°

16. How does the outlier temperature affect the mean of the data?
   Since the outlier, 35°, is much lower than the other temperatures, it lowers the mean. With the outlier, the mean, 63°, is lower than the values of most of the data.

### Practice: Word Problems

**ANIMALS** For Exercises 1–3, use the table about bears.

<table>
<thead>
<tr>
<th>Bear</th>
<th>Average Height (ft)</th>
<th>Average Weight (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaskan Brown</td>
<td>8</td>
<td>1,500</td>
</tr>
<tr>
<td>Black</td>
<td>6</td>
<td>338</td>
</tr>
<tr>
<td>Grizzly</td>
<td>7</td>
<td>588</td>
</tr>
<tr>
<td>Polar</td>
<td>7</td>
<td>850</td>
</tr>
</tbody>
</table>

1. You are writing a report on bears. You are analyzing the data on heights and weights in the table above. First look for outliers. Identify the outlier for the height data. Identify the outlier for the weight data.
   - None
   - 1,500 lb

2. Find the mean of the bear weight data with and without the outlier.
   - With outlier: 819 lb
   - Without outlier: 592 lb

3. Describe how the outlier affects the mean of the bear weight data.
   Sample answer: Such an extremely high outlier causes the mean of the data to be considerably higher than the average weight of the majority of the bears. Thus, the mean is not representative of the data.

4. **WORK** Carlos earned $23, $29, $25, $16, and $17 working at an ice cream shop after school. What is the mean amount he earned?
   - $22

5. **CARS** The cost of a tank of gas at nine different gas stations is shown below. What was the mean cost of a tank of gas?
   - $19

<table>
<thead>
<tr>
<th>Cost of Gas</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>$17</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>$18</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>$15</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>$17</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>$16</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>$23</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>$21</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>$20</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>$25</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>$14</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

6. **SCHOOL** Sally received scores on math quizzes as shown below. Find her mean score with and without both outliers.
   - With outliers: 80, 89
   - Without outliers: 84, 85, 91, 81, 52, 92, 99, 91, and 45

   Quiz Scores: 84, 85, 91, 81, 52, 92, 99, 91, and 45

   - With outliers: 80, 89
   - Without outliers: 84, 85, 91, 81, 52, 92, 99, 91, and 45

   - With outliers: $80 + 89 = 169$ / 2 = 84.5
   - Without outliers: $84 + 85 + 91 + 81 + 52 + 92 + 99 + 91 + 45 = 695$ / 9 = 77.22

   Sample answer: Such an outlier causes the mean of the data to be considerably higher than the average score of the majority of the quizzes. Thus, the mean is not representative of the data.
Linguistic Statistics

Linguistics is the study of human speech. The activity on this page shows the type of data collection and analysis that might be done by a linguist who is researching the structure of the English language. All questions refer to the Preamble to the U.S. Constitution, printed at the bottom of the page.

1. Which two consonants do you think appear most often in the Preamble? s and t
2. Which vowel do you think appears most often in the Preamble? e; u
3. Complete this table by counting the occurrences of each letter. (Hint: Your total should be 268.)

<table>
<thead>
<tr>
<th>Letter</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>14</td>
</tr>
<tr>
<td>b</td>
<td>4</td>
</tr>
<tr>
<td>c</td>
<td>7</td>
</tr>
<tr>
<td>d</td>
<td>11</td>
</tr>
<tr>
<td>e</td>
<td>39</td>
</tr>
<tr>
<td>f</td>
<td>9</td>
</tr>
<tr>
<td>g</td>
<td>2</td>
</tr>
<tr>
<td>h</td>
<td>9</td>
</tr>
<tr>
<td>i</td>
<td>20</td>
</tr>
<tr>
<td>j</td>
<td>1</td>
</tr>
<tr>
<td>k</td>
<td>0</td>
</tr>
<tr>
<td>l</td>
<td>9</td>
</tr>
<tr>
<td>m</td>
<td>7</td>
</tr>
<tr>
<td>n</td>
<td>17</td>
</tr>
<tr>
<td>o</td>
<td>25</td>
</tr>
<tr>
<td>p</td>
<td>6</td>
</tr>
<tr>
<td>q</td>
<td>1</td>
</tr>
<tr>
<td>r</td>
<td>20</td>
</tr>
<tr>
<td>s</td>
<td>21</td>
</tr>
<tr>
<td>t</td>
<td>29</td>
</tr>
<tr>
<td>u</td>
<td>10</td>
</tr>
<tr>
<td>v</td>
<td>2</td>
</tr>
<tr>
<td>w</td>
<td>2</td>
</tr>
<tr>
<td>x</td>
<td>0</td>
</tr>
<tr>
<td>y</td>
<td>3</td>
</tr>
<tr>
<td>z</td>
<td>0</td>
</tr>
</tbody>
</table>

4. Which two consonants actually appear most often in the Preamble? s and t
5. Find the mean frequency for the consonants. Which two consonants occur the closest number of times to this mean? about 7.6; c and m
6. Which vowel actually appears most often in the Preamble? e; u
7. Find the mean frequency for the vowels. Which vowel occurs the closest number of times to this mean? 21.6; i
8. Which word do you think occurs most often in the Preamble? “the” occurs most frequently.

Preamble to the Constitution of the United States of America

We the People of the United States, in order to form a more perfect Union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America.
Find the mean, median, mode, and range for each set of data.

1. 6, 9, 2, 4, 3, 6, 5
   - Mean: \( \frac{6 + 9 + 2 + 4 + 3 + 6 + 5}{7} = \frac{31}{7} \approx 4.43 \)
   - Median: 5
   - Mode: 6
   - Range: 7

2. 13, 6, 7, 13, 6
   - Mean: \( \frac{13 + 6 + 7 + 13 + 6}{5} = \frac{51}{5} = 10.2 \)
   - Median: 6
   - Mode: 6
   - Range: 7

3. 1, 15, 9, 12, 18, 9, 5, 14, 7
   - Mean: \( \frac{1 + 15 + 9 + 12 + 18 + 9 + 5 + 14 + 7}{9} = \frac{85}{9} \approx 9.44 \)
   - Median: 9
   - Mode: 9
   - Range: 18

4. 13, 7, 17, 19, 7, 15, 11, 7
   - Mean: \( \frac{13 + 7 + 17 + 19 + 7 + 15 + 11 + 7}{8} = \frac{90}{8} = 11.25 \)
   - Median: 11
   - Mode: 7
   - Range: 12

5. 3, 9, 4, 3, 9, 4, 2, 3, 8
   - Mean: \( \frac{3 + 9 + 4 + 3 + 9 + 4 + 2 + 3 + 8}{9} = \frac{40}{9} \approx 4.44 \)
   - Median: 4
   - Mode: 3
   - Range: 6

6. 25, 18, 14, 27, 25, 14, 18, 25, 23
   - Mean: \( \frac{25 + 18 + 14 + 27 + 25 + 14 + 18 + 25 + 23}{9} = \frac{156}{9} = 17.33 \)
   - Median: 24
   - Mode: 25
   - Range: 11

7. 8, 3, 9, 4, 6, 7, 5
   - Mean: \( \frac{8 + 3 + 9 + 4 + 6 + 7 + 5}{7} = \frac{39}{7} \approx 5.57 \)
   - Median: 6
   - Mode: no mode
   - Range: 5

8. 28, 32, 23, 43, 32, 27, 21, 34
   - Mean: \( \frac{28 + 32 + 23 + 43 + 32 + 27 + 21 + 34}{8} = \frac{220}{8} = 27.5 \)
   - Median: 30
   - Mode: 32
   - Range: 13

9. 157, 124, 157, 124, 157, 139
   - Mean: \( \frac{157 + 124 + 157 + 124 + 157 + 139}{6} = \frac{874}{6} = 145.67 \)
   - Median: 157
   - Mode: 157
   - Range: 22

10. 42, 35, 27, 42, 38, 35, 29, 24
    - Mean: \( \frac{42 + 35 + 27 + 42 + 38 + 35 + 29 + 24}{8} = \frac{253}{8} = 31.625 \)
    - Median: 35
    - Mode: 35
    - Range: 18

11. Write a sentence that describes how the data items in Exercise 5 vary. Sample answer: The range, 7, is not large, so the data do not vary greatly in value.

12. Why is mode not the best choice to describe the data in Exercise 5? Explain. Sample answer: The mode, 3, is less than the majority of the data in the set. The mean or median would better represent the average of the data.

**MUSEUMS**

Use the table showing the number of visitors to the art museum each month.

<table>
<thead>
<tr>
<th>Month</th>
<th>Visitors (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>3</td>
</tr>
<tr>
<td>Feb</td>
<td>11</td>
</tr>
<tr>
<td>Mar</td>
<td>5</td>
</tr>
<tr>
<td>Apr</td>
<td>4</td>
</tr>
<tr>
<td>May</td>
<td>3</td>
</tr>
<tr>
<td>Jun</td>
<td>6</td>
</tr>
<tr>
<td>Jul</td>
<td>3</td>
</tr>
<tr>
<td>Aug</td>
<td>6</td>
</tr>
<tr>
<td>Sep</td>
<td>12</td>
</tr>
<tr>
<td>Oct</td>
<td>2</td>
</tr>
<tr>
<td>Nov</td>
<td>2</td>
</tr>
<tr>
<td>Dec</td>
<td>4</td>
</tr>
</tbody>
</table>

13. What is the mean of the data? 5 thousand visitors
14. What is the median of the data? 4 thousand visitors
15. What is the mode of the data? 3 thousand visitors
16. Which measure of central tendency best describes the data? Explain. Sample answer: The median because it is closer in value to most of the data; the mean is too high and the mode is too low.
Pre-Activity
Complete the activity at the top of page 80 in your textbook. Write your answers below.

1. Find the mean wingspan. 10 ft
2. List the data in order from least to greatest. 6, 9, 10, 10, 11, 12, 12
3. Which data are in the middle of the arranged data? 10
4. Compare the number that is in the middle of the data set to the mean of the data. The values are the same.

Reading the Lesson
5. How are mean, median, and mode similar? How are they different? Sample answer: All three are similar in that they are measures of central tendency and indicate centers of data sets; they are different by their definitions. The mean is found by dividing the sum of all the values by the number of values in the set. The median is the middle number of an ordered set. If the set has an even number of values, the median is the mean of the two middle values. The mode is the number or numbers that occur most frequently in the set.

6. Which averages are discussed in the example? mean, median, mode
7. What is causing the mean to be so high? the outlier, 54
8. What if there were two 54s? How would that affect the averages? Sample answer: Both the median and one mode would be far from the center of the data. The median would become 6, which is still close to the center of most of the other values in the set.
9. Does this example illustrate its opening statement? yes

Helping You Remember
10. You may already know that a median strip refers to the concrete or landscaped divider that runs down the center of many roads. How does this idea of median relate to the meaning of median in this lesson? Sample answer: A median strip is located in the middle of a road, dividing it into two halves. Similarly, the median of a set of data is the middle value, the value that divides the data into two halves.
Puzzling Over Data

Each puzzle on this page contains an incomplete set of data. The clues give you information about the mean, median, mode, or range of the data. Working from these clues, you can decide what the missing data items must be. For example, this is how you might solve the data puzzle at the right.

There are 6 items of data.
The mean is 18, so the sum of the data must be $6 \times 18 = 108$.
Add the given data: $12 + 17 + 18 + 19 + 19 = 85$.
So the complete set of data is: 12, 17, 18, 19, 19, 23.

Find the missing data. (Assume that the data items are listed in order from least to greatest.)

1. Clue: mean = 18
   Data: 12, 17, 18, 19, 19, 23

2. Clue: median = 54.5
   Data: 36, 40, 49, 60, 65, 84

3. Clue: mean = 27
   Data: 10, 25, 27, 30, 30, 40

4. Clue: median = 120
   Data: 110, 112, 116, 124, 136, 156

5. Clue: mean = 13
   Data: 6, 9, 12, 14, 18, 19

6. Clue: mean = 7
   Data: 1, 4, 8, 9, 10, 10

7. Clue: mean = 60
   Data: 50, 52, 52, 56, 72, 78

8. Clue: median = 24
   Data: 6, 15, 20, 28, 28, 30

Using an inappropriate measure of central tendency can cause readers to make a wrong conclusion.

Refer to the table. The store says the average price of an electronic pet is $12. Explain how using this average to attract customers with low prices is misleading.

<table>
<thead>
<tr>
<th>Year</th>
<th>Electronic Pet Prices ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>14</td>
</tr>
<tr>
<td>2000</td>
<td>15</td>
</tr>
<tr>
<td>2001</td>
<td>15</td>
</tr>
<tr>
<td>2002</td>
<td>20</td>
</tr>
<tr>
<td>2003</td>
<td>20</td>
</tr>
<tr>
<td>2004</td>
<td>49</td>
</tr>
</tbody>
</table>

Order the data from least to greatest: 12, 15, 15, 19, 19, 20, 20, 21, 24, 49.
- mean: $19$
- median: $15$
- mode: $19$

The store used the mode as the average. Because the mode price is less than the other prices, it is not the most accurate average to use.

Exercises

1. In Example 1, how could you change Graph A to appear to show that the cost rose more slowly? Sample answer: Change the scale to 3.

2. Oleta’s test scores in order from least to greatest were 19, 75, 76, 82, 83.
   - Find the mean, median, and mode of the data. Which measure might be misleading in describing the average number of points Oleta earned?
   - mean: 67.76; median: 76; mode: no mode; the mean is too low because it includes the outlier 19.
Practice: Word Problems

Analyzing Graphs

For Exercises 1 and 2, use Graph A. For Exercises 3 and 4, use Graphs B and C. The graphs show the number of DVDs and videos sold by a video store.

1. About how many times fewer DVDs than videos appear to have been sold? about two and a half times

2. Explain how Graph A is misleading. The vertical scale is inconsistent since it does not include 50 through 150.

3. The graphs show the same data. Which graph appears to show that the number of DVDs and videos sold increased more rapidly? Explain. Graph B; the scale is different.

4. The store owner is trying to get a loan from the bank and wants to show that business is good. Which graph should the store owner show the bank? Explain. Graph B; The bank is more likely to invest money in a company with rapidly increasing sales.

5. MARKETING A store advertises that it has the lowest average price for T-shirts in town. Find the mean, median, and mode of the prices.

<table>
<thead>
<tr>
<th>T-Shirt Prices:</th>
<th>$14, $5, $10, $12, $5, $4, $13</th>
</tr>
</thead>
<tbody>
<tr>
<td>$9, $10; $5</td>
<td></td>
</tr>
</tbody>
</table>

6. MARKETING Use your answer from Exercise 5. Which measure of central tendency describes the average T-shirt price the most accurately? Explain. Sample answer: Median; The median is slightly closer to most of the values than the mean. The mode is a much lower value than the other values in the data set.
Be a Data Detective!

Each of the graphs on this page has been drawn incorrectly. Can you detect the mistake?

1. Mistake: Missing information about what each symbol means.
2. Mistake: Interval from 1800–1900 is not equal to other intervals.
3. Mistake: Line graph is not appropriate for these data.
4. Mistake: Axes are reversed.

5. Draw a corrected graph for Exercise 3.

Pre-Activity

Complete the activity at the top of page 86 in your textbook. Write your answer below.

1. Suppose you look at the lengths of the bars that represent Dan Marino and Terry Bradshaw. You might conclude that Dan Marino threw three times as many touchdown passes as Terry Bradshaw. Why is this conclusion incorrect? The bar that represents Dan Marino is three times as long as the bar that represents Terry Bradshaw. However, by comparing the numbers, you find that Dan Marino threw twice as many touchdown passes as Terry Bradshaw.

Reading the Lesson

For Exercises 2–4, look at the first sentence below the activity at the top of page 86: “Graphs let readers analyze and interpret data easily.”

2. Look in a dictionary for meaning of the word analyze. Write a definition that fits the sentence just quoted. Sample answer: to examine in detail so as to determine the nature or tendencies of

3. Do the same for the word interpret. Write a definition that fits the sentence just quoted. Sample answer: to explain the meaning of

4. Why is it important to analyze as well as interpret data in a graph? Sample answer: Because as the examples show, graphs can be misleading. Only by analyzing the data that is being graphed and how the data is graphed can someone avoid interpreting the data incorrectly if it is graphed in a misleading way.

5. Why is the graph in the activity at the top of page 86 misleading? because the horizontal scale does not start at 0

6. On a separate sheet of paper, redraw the graph in the activity at the top of page 86 to correct the problem. Do the lengths of the Marino and Bradshaw bars represent more closely the relationship between touchdown passes actually thrown by these players? See students’ work; yes

Helping You Remember

7. Look up the word mislead in a dictionary. Write the definition here. Then tell how it is easy for a graph to mislead. Sample answer: to lead in a wrong direction; it is easy for a graph to mislead because we often do not study a graph closely. We just form first impressions from what we see in the visual aspects of the graph.
Chapter 2 Assessment Answer Key

Form 1
Page 101

1. A
2. H
3. A
4. G
5. C
6. H
7. A
8. G
9. C

Page 102

10. I
11. C
12. I
13. D
14. G
15. C
16. F
17. C
18. H

Form 2A
Page 103

1. D
2. I
3. B
4. I
5. C
6. I
7. A
8. G

B: See students’ work.

(continued on the next page)
<table>
<thead>
<tr>
<th>Form 2A</th>
<th>Form 2B</th>
<th>B: 4, 4, and 7B: 3, 3, and 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page 104</td>
<td>Page 105</td>
<td>Page 106</td>
</tr>
<tr>
<td>9. <strong>B</strong></td>
<td>1. <strong>C</strong></td>
<td>9. <strong>A</strong></td>
</tr>
<tr>
<td>10. <strong>H</strong></td>
<td>2. <strong>G</strong></td>
<td>10. <strong>H</strong></td>
</tr>
<tr>
<td>11. <strong>D</strong></td>
<td>11. <strong>A</strong></td>
<td>12. <strong>H</strong></td>
</tr>
<tr>
<td>14. <strong>H</strong></td>
<td>15. <strong>B</strong></td>
<td>16. <strong>G</strong></td>
</tr>
<tr>
<td>15. <strong>A</strong></td>
<td>17. <strong>D</strong></td>
<td>18. <strong>G</strong></td>
</tr>
<tr>
<td>16. <strong>G</strong></td>
<td>18. <strong>G</strong></td>
<td>19. <strong>C</strong></td>
</tr>
<tr>
<td>17. <strong>A</strong></td>
<td>19. <strong>C</strong></td>
<td>20. <strong>H</strong></td>
</tr>
<tr>
<td>18. <strong>I</strong></td>
<td>20. <strong>H</strong></td>
<td>8. <strong>G</strong></td>
</tr>
<tr>
<td>20. <strong>H</strong></td>
<td>23. <strong>H</strong></td>
<td>24. <strong>A</strong></td>
</tr>
<tr>
<td><strong>B:</strong> 4, 4, and 7</td>
<td><strong>B:</strong> 3, 3, and 9</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 2 Assessment Answer Key

Form 2C
Page 107

1. | Votes |
   | Person | Tally | Frequency |
   | Mia    | || | 3 |
   | Ali    | || | 7 |
   | Ted    | || | 4 |
   | Hattie | || | 6 |

2. Ali

3. Hattie received twice the votes Mia did.

4. pepperoni

5. mushroom and sausage

6. About twice as many people like mushroom as like onion as a pizza topping.

7. $49

8. $14; the outlier makes the mean higher.

9. Sample answer: mode; yes, because the mode is at the low end of the data set

10. Sample answer: Graph B

11. Stem | Leaf
   | 6 | 6 8 |
   | 7 | 2 3 9 9 |
   | 8 | 1 5 7 7 7 |
   | 9 | 0 1 2 5 6 |
   | 8 | 5 = 85 |

12. 10

13. 30

14. 86; 87

15. Ella's Savings

16. February

17. Sample answer: about $300 in August; by extending the line on the graph

18. Graph B

19. Graph A
   Graph A: inconsistent vertical scale;
   Graph B: The vertical scale starts at 9.

20. Sample answer:
    1, 2, 3, 4, 5, 6, 7, 8, 9

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A25 Mathematics: Applications and Concepts, Course 1
1. | Votes |
   | Person | Tally | Frequency |
   | Miguel | || | 2 |
   | Aki | || | 6 |
   | Tansy | || | 7 |
   | Hannah | || | 5 |

2. Aki

3. Aki received three times more votes than Miguel did.

4. dog

5. cow and rabbit

6. About twice as many people chose cats as chose monkeys as a favorite animal.

7. $33

8. $8: Since the outlier is greater than the other values, the mean is greater and not very representative of the data set.

9. Sample answer: mode; yes, because the mode is at the low end of the data set.

10. Sample answer: about $250 in August; by extending the line on the graph until reaching a vertical position of August

11. Stem | Leaf
   | 6 | 8 9 |
   | 7 | 2 8 8 8 |
   | 8 | 0 2 4 7 7 9 |
   | 9 | 1 2 5 8 |

   8 | 4 = 84

12. 10

13. 30

14. 83; 78

15. Ebony's Savings

16. April

17. Sample answer: about $250 in August; by extending the line on the graph until reaching a vertical position of August

18. Graph A

19. Graph B

   Graph A: The vertical scale is inconsistent.
   Graph B: The vertical scale starts at 6.

20. Sample answer: 1, 2, 3, 4, 5, 6, 7
1. 4

2. 14

From the frequency table you cannot tell whether anyone scored 110 points.

3. 67%

4. 25%

5. 33%

6. 92%

7. 43; 16

8. 15; 15

The mean is the measure that is most misleading, since it is greatly increased by the outlier.

9. 13

10. mean, 82; It’s the highest of the three averages.

11. Because the vertical scale is not consistent

12. 1990

13. 1998

14. 68, 68, 80, 81, and 98

15. Cafeteria Lunches

16. Alaskan City

17. The mean, 4, is most representative of the data, since the mode and the median are both to the lower end of the data set.

18. mississippi
# Chapter 2 Assessment Answer Key

## Page 113, Extended Response Assessment

### Scoring Rubric

<table>
<thead>
<tr>
<th>Level</th>
<th>Specific Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>The student demonstrates a <strong>thorough understanding</strong> of the mathematics concepts and/or procedures embodied in the task. The student has responded correctly to the task, used mathematically sound procedures, and provided clear and complete explanations and interpretations. The response may contain minor flaws that do not detract from the demonstration of a thorough understanding.</td>
</tr>
<tr>
<td>3</td>
<td>The student demonstrates an <strong>understanding</strong> of the mathematics concepts and/or procedures embodied in the task. The student's response to the task is essentially correct with the mathematical procedures used and the explanations and interpretations provided demonstrating an essential but less than thorough understanding. The response may contain minor errors that reflect inattentive execution of the mathematical procedures or indications of some misunderstanding of the underlying mathematics concepts and/or procedures.</td>
</tr>
<tr>
<td>2</td>
<td>The student has demonstrated only a <strong>partial understanding</strong> of the mathematics concepts and/or procedures embodied in the task. Although the student may have used the correct approach to obtaining a solution or may have provided a correct solution, the student's work lacks an essential understanding of the underlying mathematical concepts. The response contains errors related to misunderstanding important aspects of the task, misuse of mathematical procedures, or faulty interpretations of results.</td>
</tr>
<tr>
<td>1</td>
<td>The student has demonstrated a <strong>very limited understanding</strong> of the mathematics concepts and/or procedures embodied in the task. The student's response to the task is incomplete and exhibits many flaws. Although the student has addressed some of the conditions of the task, the student reached an inadequate conclusion and/or provided reasoning that was faulty or incomplete. The response exhibits many errors or may be incomplete.</td>
</tr>
<tr>
<td>0</td>
<td>The student has provided a <strong>completely incorrect</strong> solution or uninterpretable response, or no response at all.</td>
</tr>
</tbody>
</table>
### Chapter 2 Assessment Answer Key

Page 113, Extended Response Assessment
Sample Answers

*In addition to the scoring rubric found on page A28, the following sample answers may be used as guidance in evaluating extended response assessment items.*

1. **Students’ Grades**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. a. **Students’ Grades**

b. The scale includes the number of students getting each grade. The interval is 2 in order to make all data fit easily on the graph.

c. The graph shows how many students got each grade. It compares the different grades.

d. The number of students with a grade of A is the same as the number with a grade of D. It is twice as many as the number of students with grade of F.

e. The interval is inconsistent.

3. a. **Bicycle Sales**

b. The scale is 0 to 25. The interval is 5. These were chosen to make the graph a manageable size.

c. The graph shows the change in sales of bicycles over a few years.

d. The sales went down slightly, went back up to where they started, then increased steadily at the same rate.

e. Bicycles sold should be about 25,000, which can be found by extending the line until reaching a vertical position of 2003.

f. See students’ work.

4. a. **Stem | Leaf**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6 8</td>
</tr>
<tr>
<td>7</td>
<td>2 6 6 6 8 8 8</td>
</tr>
<tr>
<td>8</td>
<td>0 2 2 2 4 4 6 8</td>
</tr>
<tr>
<td>9</td>
<td>0 2 4 4 8 5 6 = 56</td>
</tr>
</tbody>
</table>

b. The data is clustered between 66 and 98.

c. mean: 80; median: 82; mode: 82; range: 64

d. 34 is an outlier. Without the outlier, the mean is 82. The outlier brings the mean down.
Vocabulary Test/Review
Page 114
1. median
2. data
3. circle graph
4. interval
5. outliers
6. mode
7. scale
8. line graph
9. stem-and-leaf plot
10. average

11. Sample answer: involves collecting, organizing, analyzing, and presenting data
12. the sum of the pieces of data in a set divided by the number of pieces of data

Sample answer: involves collecting, organizing, analyzing, and presenting data

Quiz (Lessons 2-1 and 2-2)
Page 115
1. See students’ work.
2. Students’ Math Scores

Quiz (Lessons 2-5 and 2-6)
Page 116
1. Stem | Leaf
   6 | 6 7
   7 | 3 6 6 8 9
   8 | 2 2 3 3 4
   9 | 0 1 3 8

   $718 = 78$

2. $149$
3. $6$
4. $14$
5. $10$

Quiz (Lessons 2-7 and 2-8)
Page 116
1. C

Quiz (Lessons 2-3 and 2-4)
Page 115
1. math
2. math and gym
3. 33%
   In March it was about 40° in Denver and about 65° in Austin.
4. The mean, 72; it is lowered by the outlier
5. The vertical scale starts at 70 rather than at 0.
Chapter 2 Assessment Answer Key

Chapter 2 Mid-Chapter Test
Page 117

1. **B**

2. **H**

3. **B**

4. **H**

5. **College costs increased from 1970 to 2000.**

6. **Children at the Movie**

7. **Sample answer: Start the vertical scale at 4 instead of 0.**

8. **Lin’s Test Scores**

9. **Sample answer: 86**

10. **67**

11. **58; 66; 22**

12. **Mode; the mode falls at the low end of the data set and is not as representative of the data as the mean or median.**

Chapter 2 Cumulative Review
Page 118

1. **composite**

2. **5^3; 125**

3. **34**

4. **1**

5. **16 children**

6. **Sample answer:**

7. **Sample answer:**

8. **Sample answer:**

9. **Sample answer:**

10. **67**

11. **58; 66; 22**

12. **Mode; the mode falls at the low end of the data set and is not as representative of the data as the mean or median.**
1. A B C D

2. F G H I

3. A B C D

4. F G H I

5. A B C D

6. F G H I

7. A B C D

8. F G H I

9. A B C D

10. 2

11. 8 \cdot 8 \cdot 8; 512

12. 6

13. 2

14. a. 15 cm

b. at the end of the sixth month

c. the fifth month

d. Sample answer: At the end of the tenth month; by extending the graph until reaching a horizontal position of 26
Chapter 2 Assessment Answer Key

Unit 1 Test

Page 121

1. 12 laps

2. 2 and 4; even

3. prime

4. composite

5. $3 \times 3 \times 3$

6. $2 \times 2 \times 3 \times 3$

7. $6^2; 36$

8. $1^5; 1$

9. 11

10. 15

11. 5

12. 41

13. 16

14. 14

15. 432 cm$^2$

16. Math Score | Tally | Frequency
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>[ • • • ]</td>
<td>7</td>
</tr>
<tr>
<td>B</td>
<td>[ • • • • ]</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td>[ • • ]</td>
<td>3</td>
</tr>
</tbody>
</table>

17. B

18. Math Scores

19. More than three times as many students got a B as got a C.

20. Sample answer: Make the numbers on the vertical scale inconsistent.

21. Eva’s Savings

22. May

23. Sample answer: $220

24. ride with parent

25. About twice as many students ride with a parent as take the bus.

26. 7

27. 25

28. 4

29. 4

30. 2

31. 23

32. median; it is closer to more of the data values.