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

<table>
<thead>
<tr>
<th>Workbook</th>
<th>MHID</th>
<th>ISBN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Guide and Intervention Workbook</td>
<td>0-07-878871-4</td>
<td>978-0-07-878871-0</td>
</tr>
<tr>
<td>Skills Practice Workbook</td>
<td>0-07-878873-0</td>
<td>978-0-07-878873-4</td>
</tr>
<tr>
<td>Practice Workbook</td>
<td>0-07-878875-7</td>
<td>978-0-07-878875-8</td>
</tr>
<tr>
<td>Word Problem Practice Workbook</td>
<td>0-07-878877-3</td>
<td>978-0-07-878877-2</td>
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</table>

Spanish Versions

<table>
<thead>
<tr>
<th>Workbook</th>
<th>MHID</th>
<th>ISBN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Guide and Intervention Workbook</td>
<td>0-07-878872-2</td>
<td>978-0-07-878872-7</td>
</tr>
<tr>
<td>Skills Practice Workbook</td>
<td>0-07-878874-9</td>
<td>978-0-07-878874-1</td>
</tr>
<tr>
<td>Practice Workbook</td>
<td>0-07-878876-5</td>
<td>978-0-07-878876-5</td>
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<tr>
<td>Word Problem Practice Workbook</td>
<td>0-07-878878-1</td>
<td>978-0-07-878878-9</td>
</tr>
</tbody>
</table>

Answers for Workbooks  The answers for Chapter 8 of these workbooks can be found in the back of this Chapter Resource Masters booklet.

StudentWorks Plus™ This CD-ROM includes the entire Student Edition test along with the English workbooks listed above.

TeacherWorks Plus™ All of the materials found in this booklet are included for viewing, printing, and editing in this CD-ROM.


These masters contain a Spanish version of Chapter 8 Test Form 2A and Form 2C.
Teacher’s Guide to Using the

Chapter 8 Resource Masters

The Chapter 8 Resource Masters includes the core materials needed for Chapter 8. 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 on the TeacherWorks Plus™ CD-ROM.

Chapter Resources

**Student-Built Glossary** (pages 1–2) These masters are 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. Give this to students before beginning Lesson 8-1. Encourage them to add these pages to their mathematics study notebooks. Remind them to complete the appropriate words as they study each lesson.

**Family Letter and Family Activity** (pages 3–6) The letter informs your students' families of the mathematics they will be learning in this chapter. The family activity helps them to practice problems that are similar to those on the state test. A full solution for each problem is included. Spanish versions of these pages are also included. Give these to students to take home before beginning the chapter.

**Anticipation Guide** (pages 7–8) This master, presented in both English and Spanish, is a survey used before beginning the chapter to pinpoint what students may or may not know about the concepts in the chapter. Students will revisit this survey after they complete the chapter to see if their perceptions have changed.

Lesson Resources

**Lesson Reading Guide** Get Ready for the Lesson reiterates the questions from the beginning of the Student Edition lesson. Read the Lesson asks students to interpret the context of and relationships among terms in the lesson. Finally, Remember What You Learned asks students to summarize what they have learned using various representation techniques. Use as a study tool for note taking or as an informal reading assignment. It is also a helpful tool for ELL (English Language Learners).

**Study Guide and Intervention** This master provides vocabulary, key concepts, additional worked-out examples and Check Your Progress exercises to use as a reteaching activity. It can also be used in conjunction with the Student Edition as an instructional tool for students who have been absent.

**Skills Practice** This master focuses more on the computational nature of the lesson. Use as an additional practice option or as homework for second-day teaching of the lesson.

**Practice** This master closely follows the types of problems found in the Exercises section of the Student Edition and includes word problems. Use as an additional practice option or as homework for second-day teaching of the lesson.
Word Problem Practice  This master includes additional practice in solving word problems that apply the concepts of the lesson. Use as an additional practice or as homework for second-day teaching of the lesson.

Enrichment  These activities may extend the concepts of the lesson, offer a historical or multicultural look at the concepts, or widen students’ perspectives on the mathematics they are learning. They are written for use with all levels of students.

Graphing Calculator, Scientific Calculator, or Spreadsheet Activities  These activities present ways in which technology can be used with the concepts in some lessons of this chapter. Use as an alternative approach to some concepts or as an integral part of your lesson presentation.

Assessment Options
The assessment masters in the Chapter 8 Resource Masters offer a wide range of assessment tools for formative (monitoring) assessment and summative (final) assessment.

Student Recording Sheet  This master corresponds with the standardized test practice at the end of the chapter.

Pre-AP Rubric  This master provides information for teachers and students on how to assess performance on open-ended questions.

Quizzes  Four free-response quizzes offer assessment at appropriate intervals in the chapter.

Mid-Chapter Test  This 1-page test provides an option to assess the first half of the chapter. It parallels the timing of the Mid-Chapter Quiz in the Student Edition and includes both multiple-choice and free-response questions.

Vocabulary Test  This test is suitable for all students. It includes a list of vocabulary words and 10 questions to assess students’ knowledge of those words. This can also be used in conjunction with one of the leveled chapter tests.

Leveled Chapter Tests
• Form 1 contains multiple-choice questions and is intended for use with below grade level students.
• Forms 2A and 2B contain multiple-choice questions aimed at on grade level students. These tests are similar in format to offer comparable testing situations.
• Forms 2C and 2D contain free-response questions aimed at on grade level students. These tests are similar in format to offer comparable testing situations.
• Form 3 is a free-response test for use with above grade level students.

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

Extended-Response Test  Performance assessment tasks are suitable for all students. Sample answers and a scoring rubric are included for evaluation.

Standardized Test Practice  These three pages are cumulative in nature. It includes three parts: multiple-choice questions with bubble-in answer format, griddable questions with answer grids, and short-answer free-response questions.

Answers
• The answers for the Anticipation Guide and Lesson Resources are provided as reduced pages with answers appearing in red.
• Full-size answer keys are provided for the assessment masters.
This is an alphabetical list of new vocabulary terms you will learn in Chapter 8. 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>analyze</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bar graph</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cluster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>histogram</td>
<td></td>
<td></td>
</tr>
<tr>
<td>leaf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>line graph</td>
<td></td>
<td></td>
</tr>
<tr>
<td>line plot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocabulary Term</td>
<td>Defined on Page</td>
<td>Definition/Description/Example</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>mean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>measures 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>
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<tr>
<td>range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>scatter plot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>statistics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stem-and-leaf-plot</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dear Parent or Guardian:

We are often overwhelmed with large amounts of data, but organizing data into tables and graphs can help us make sense of it all. Once the data are organized, we can identify patterns and make predictions. We can then make reasonable decisions based on the information we see. Knowing how to correctly interpret the statistics can help keep us from making incorrect decisions based on the data.

In Chapter 8, Statistics: Analyzing Data, your child will learn several different ways to describe, analyze, and interpret data. Your child will learn about line plots, measures of central tendency and range, stem-and-leaf plots, bar graphs, histograms, line graphs, scatter plots, and about selecting an appropriate display. Additionally, your child will learn to use a graph in solving problems and to wade through misleading statistics. 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 you can do with your child that practices how the math we will be learning in Chapter 8 might be tested. You may also wish to log on to ca.gr6math.com for self-check quizzes and other study help. If you have any questions or comments, feel free to contact me at school.

Sincerely,

Signature of Parent or Guardian ______________________________________ Date ____________
1. Find the median of the set of numbers on the stem-and-leaf plot below.

<table>
<thead>
<tr>
<th>stem</th>
<th>leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1 4 7</td>
</tr>
<tr>
<td>1</td>
<td>8 9</td>
</tr>
<tr>
<td>2</td>
<td>3 5 6 6</td>
</tr>
<tr>
<td>3</td>
<td>0 0 0 1</td>
</tr>
<tr>
<td>4</td>
<td>2 3</td>
</tr>
<tr>
<td>5</td>
<td>4 6 1</td>
</tr>
</tbody>
</table>

What number is the median?

A 25  C 30
B 26  D 31

Solution

1. Hint: The key indicates that the number on the left of the stem-and-leaf plot is the tens place and the numbers on the right of the line are the ones place. For example, the first line represents the numbers 1, 4, and 7. The median is the number in the middle of a set when the set is listed in ascending or descending order.

The median is the middle number in the set. There are 17 numbers in the set, so the middle is the 9th number (there are eight numbers on either side of it in the set). The top left leaf represents the least number. Count each leaf in order to find the 9th number. The median of this set is 26.

The answer is B.

2. Constance found the mean and median of her first five quiz scores, 87, 89, 89, 92, and 95. If she receives an 85 on her next quiz, then

A the mean would increase.
B the mean would decrease.
C the median would increase.
D the median would decrease.

Solution

2. Hint: Find the mean and median of the original five scores first. The mean of a set of data is the sum of the data divided by the number of items in the data set. The median of a set of data is the middle number of the ordered date, or the mean of the middle two numbers.

The mean of the original data set is $\frac{87 + 89 + 89 + 92 + 95}{5}$ or 90.4. The median is 89. If 85 is added to the original data set, the median remains the same, 89, and the mean becomes 89.5. So, if 85 is added to the data set, the mean would decrease.

The answer is B.
Estimado padre o apoderado:

A menudo, nos abruman las grandes cantidades de datos, pero al organizarlos en tablas y gráficas los comprendemos mejor. Una vez organizados los datos, podemos identificar patrones y hacer predicciones. Entonces, somos capaces de tomar decisiones razonables en base a la información observada. El saber cómo interpretar correctamente las estadísticas nos ayuda a tomar decisiones correctas en base a los datos.

En el Capítulo 8, Estadística: Analiza datos, su hijo(a) aprenderá varias maneras de describir, analizar e interpretar datos. Aprenderá acerca de esquemas lineales, medidas de tendencia central y rango, gráficas de tallo y hojas, gráficas de barras, histogramas, gráficas lineales, gráficas de dispersión y sobre cómo seleccionar un despliegue adecuado. Además su hijo(a) aprenderá a usar gráficas para resolver problemas y discernir estadísticas engañosas. En el estudio de este capítulo, su hijo(a) completará una variedad de tareas y actividades diarias y es posible que trabaje en un proyecto del capítulo.

Al firmar esta carta y devolverla con su hijo(a), usted se compromete a ayudarlo(a) a participar en su aprendizaje. Junto con esta carta, va incluida una actividad que puede realizar con él(ella) y la cual practica lo que podrían encontrar en las pruebas de los conceptos matemáticos que aprenderán en el Capítulo 8. Además, visiten ca.gr6math.com para ver autocontroles y otras ayudas para el estudio. Si tiene cualquier pregunta o comentario, por favor contácteme en la escuela.

Cordialmente,

Firma del padre o apoderado ___________________________ Fecha ______
### Actividad en familia

#### Práctica de estándares

Doblen la página a lo largo de las líneas punteadas. Resuelvan cada problema en otra hoja de papel. Luego, desdoblen la página y revisen las respuestas.

1. Calculen la mediana del conjunto de números en la gráfica de tallo y hojas.

<table>
<thead>
<tr>
<th>tallo</th>
<th>hojas</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1 4 7</td>
</tr>
<tr>
<td>1</td>
<td>8 9</td>
</tr>
<tr>
<td>2</td>
<td>3 5 6 6</td>
</tr>
<tr>
<td>3</td>
<td>0 0 0 1</td>
</tr>
<tr>
<td>4</td>
<td>2 3</td>
</tr>
<tr>
<td>5</td>
<td>4 6 1</td>
</tr>
</tbody>
</table>

¿Qué número es la mediana?

- **A** 25
- **B** 26
- **C** 30
- **D** 31

**Solución**

1. Ayuda: La clave indica que el número a la izquierda de la gráfica de tallo y hojas es el lugar de las decenas y los números a la derecha, el lugar de las unidades. Por ejemplo, la primera línea representa los números 1, 4 y 7. La mediana es el número en el medio de un conjunto cuando el conjunto se ordena de manera ascendente o descendente.

La mediana es el número del medio en el conjunto. Hay 17 números en el conjunto, de modo que el del medio es el número noveno (hay ocho números a cada uno de sus lados en el conjunto). La hoja superior izquierda representa el número menor. Cuenten cada una de las hojas para hallar el número noveno. La mediana de este conjunto es 26.

La respuesta es **B**.

2. Constance calculó la media y la mediana de las calificaciones que sacó en sus primeros cinco controles: 87, 89, 89, 92 y 95. Si ella saca 85 en su próximo control, entonces

- **A** la media aumentaría.
- **B** la media disminuiría.
- **C** la mediana aumentaría.
- **D** la mediana disminuiría.

**Solución**

2. Ayuda: Primero calcula la media y la mediana de las cinco calificaciones originales. La media de un conjunto de datos es la suma de los datos dividida entre el número de elementos en el conjunto de datos. La mediana de un conjunto de datos es el número central o la media de los dos números centrales, después de ordenar los datos.

La media del conjunto original de datos es \( \frac{87 + 89 + 89 + 82 + 95}{5} = 90.4 \). La mediana es 89. Si se suma 85 al conjunto original de datos, la mediana permanece igual, 89, y la media se convierte en 89.5. Entonces, si se suma 85 al conjunto de datos, la media disminuiría.

La respuesta es **B**.
## Anticipation Guide

### Statistics: Analyzing Data

#### Step 1

**Before you begin Chapter 8**

- Read each statement.
- Decide whether you Agree (A) or Disagree (D) with the statement.
- Write A or D in the first column OR if you are not sure whether you agree or disagree, write NS (Not Sure).

<table>
<thead>
<tr>
<th>STEP 1 A, D, or NS</th>
<th>Statement</th>
<th>STEP 2 A or D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>When drawing a number line for a line plot you must always start the number line at 0.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>The mean of a set of data is the sum of the data divided by the number of items in the data set.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>The mode of a set of data is the middle number of the ordered data.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>In a stem-and-leaf plot of the data 12, 15, 22, 10, 26, 37, 14, and 36, the leaves would be formed by the digits 0, 2, 4, 5, 6, and 7.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>The bars of a bar graph must have equal widths but the bars of a histogram can have different widths.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>The same conclusions can be drawn about a data set just as easily from either a chart or a graph.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Line graphs are better to predict future events than scatter plots.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Since all graphs are useful to help draw conclusions about a set of data, any graph may be chosen to represent that set.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Using a scale of uneven intervals on a graph can result in misleading information.</td>
<td></td>
</tr>
</tbody>
</table>

#### Step 2

**After you complete Chapter 8**

- Reread each statement and complete the last column by entering an A or a D.
- Did any of your opinions about the statements change from the first column?
- For those statements that you mark with a D, use a piece of paper to write an example of why you disagree.
### Ejercicios preparatorios

#### Estadísticas: Analiza datos

**Antes de comenzar el Capítulo 8**

- Lee cada enunciado.
- Decide si estás de acuerdo (A) o en desacuerdo (D) con el enunciado.
- Escribe A o D en la primera columna O si no estás seguro(a) de la respuesta, escribe NS (No estoy seguro(a)).

<table>
<thead>
<tr>
<th>PASO 1 A, D o NS</th>
<th>Enunciado</th>
<th>PASO 2 A o D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Al dibujar una recta numérica para un esquema lineal debes empezar siempre la recta numérica en 0.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>El promedio de un conjunto de datos es la suma de los datos en el conjunto dividido entre el número de elementos de dicho conjunto.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>La moda de un conjunto de datos es el número medio de los datos ordenados.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>En un diagrama de tallo y hojas para los datos 12, 15, 22, 10, 26, 37, 14 y 36, las hojas se formarían por los dígitos 0, 2, 4, 5, 6 y 7.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Las barras de una gráfica de barras deben tener el mismo ancho pero las barras de un histograma pueden tener anchos diferentes.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Las mismas conclusiones sobre un conjunto de datos es posible obtenerlas tanto de un cuadro como de una gráfica.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Las gráficas de líneas son mejores para predecir eventos futuros que las gráficas de dispersión.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Dado que todas las gráficas son útiles para sacar conclusiones sobre conjuntos de datos, se puede usar cualquier gráfica para representar dicho conjunto.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Usar una escala de intervalos irregulares para una gráfica puede resultar en información errónea.</td>
<td></td>
</tr>
</tbody>
</table>

**Después de completar el Capítulo 8**

- Vuelve a leer cada enunciado y completa la última columna con una A o una D.
- ¿Cambió cualquiera de tus opiniones sobre los enunciados de la primera columna?
- En una hoja de papel aparte, escribe un ejemplo de por qué estás en desacuerdo con los enunciados que marcaste con una D.
Get Ready for the Lesson

Read the introduction at the top of page 396 in your textbook. Write your answers below.

1. Do any of the values seem much greater or much less than the other data values?

2. Do some of the buildings have the same number of stories? Is this easy to see? Explain.

Read the Lesson

3. If the least number of a data set is 75 and the greatest number in the set is 200, what is the range?

4. Give an example of a set of data for which you could create a line plot.

5. If you see a gap in a line plot, what do you know about that interval?

Remember What You Learned

6. Discuss what pieces of information a line plot can provide for a set of data.
**Example 1**

**SHOE SIZE** The table shows the shoe size of students in Mr. Kowa's classroom. Make a line plot of the data.

**Step 1** Draw a number line. Because the smallest size is 4 and the largest size is 14, you can use a scale of 4 to 14 and an interval of 2.

**Step 2** Put an “×” above the number that represents the shoe size of each student.

**Example 2** Use the line plot in Example 1. Identify any clusters, gaps, or outliers and analyze the data by using these values. What is the range of data?

Many of the data cluster around 6 and 10. You could say that most of the shoe sizes are 6 or 10. There is a gap between 11 and 14, so there are no shoe sizes in this range. The number 14 appears removed from the rest of the data, so it would be considered an outlier. This means that the shoe size of 14 is very large and is not representative of the whole data set.

The greatest shoe size is 14, and the smallest is 4. The range is 14 – 4 or 10.

**Exercises**

**PETS** For Exercises 1–3 use the table at the right that shows the number of pets owned by different families.

<table>
<thead>
<tr>
<th>Number of Pets</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 1 2 0</td>
</tr>
<tr>
<td>3 1 1 2</td>
</tr>
<tr>
<td>8 3 1 4</td>
</tr>
</tbody>
</table>

1. Make a line plot of the data.

2. Identify any clusters, gaps, or outliers.

3. What is the range of the data?
For Exercises 1–3, use the data at the right that shows the number of fish each person caught on a fishing trip.

1. Make a line plot of the data.

<table>
<thead>
<tr>
<th>Number of Fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 1 0 1 0</td>
</tr>
<tr>
<td>1 2 3 1 4</td>
</tr>
<tr>
<td>2 1 2 3 0</td>
</tr>
<tr>
<td>1 2 3 2 7</td>
</tr>
</tbody>
</table>

2. What is the range of the data?

3. Identify any clusters, gaps, or outliers and analyze the data by describing what these values represent.

Make a line plot for each set of data. Identify any clusters, gaps, or outliers.

4. **Test Scores**
   - 83 84 92 91
   - 82 81 80 94
   - 85 95 96 84
   - 94 98 93 90

5. **Rainfall (in.)**
   - 3 2 4 3
   - 1 8 7 3
   - 2 9 4 0

For Exercises 6–8, use the line plot at the right.

6. What is the range of the data?

7. What number occurred most often?

8. Identify any clusters, gaps, or outliers.
8-1 Practice

Line Plots

Display each set of data in a line plot.

1. **Weights of Dogs (pounds)**

<table>
<thead>
<tr>
<th>Weight (pounds)</th>
<th>21</th>
<th>12</th>
<th>33</th>
<th>14</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>30</td>
<td>18</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>21</td>
<td>14</td>
<td>19</td>
<td>12</td>
</tr>
</tbody>
</table>

2. **Quiz Scores**

<table>
<thead>
<tr>
<th>Quiz Score</th>
<th>88</th>
<th>94</th>
<th>83</th>
<th>94</th>
<th>90</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>99</td>
<td>78</td>
<td>88</td>
<td>94</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>88</td>
<td>96</td>
<td>86</td>
<td>93</td>
</tr>
</tbody>
</table>

3. **Miles Driven**

<table>
<thead>
<tr>
<th>Miles Driven</th>
<th>132</th>
<th>115</th>
<th>95</th>
<th>111</th>
<th>108</th>
<th>94</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>124</td>
<td>113</td>
<td>125</td>
<td>95</td>
<td>110</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>122</td>
<td>107</td>
<td>99</td>
<td>115</td>
<td>121</td>
<td>133</td>
</tr>
</tbody>
</table>

4. **Drying Time (minutes)**

<table>
<thead>
<tr>
<th>Drying Time</th>
<th>15</th>
<th>16</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14</td>
<td>16</td>
<td>13</td>
<td>16</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>13</td>
<td>16</td>
<td>15</td>
<td>14</td>
<td>15</td>
</tr>
</tbody>
</table>

**RAINFALL** For Exercises 5–9, analyze the line plot that shows the amount of daily rainfall in inches during 30 consecutive days in a rainy season.

- **Daily Rainfall (inches)**

5. Find the range of the data.

6. How many days did it rain more than 1.0 inch?

7. What rainfall amount occurred most often?

8. Identify any clusters, gaps, or outliers.
TELEVISION SETS  For Exercises 1–6, use the table below. It shows the number of television sets owned by 30 different families.

<table>
<thead>
<tr>
<th>Number of TVs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 1 2 4 3 0</td>
</tr>
<tr>
<td>2 3 2 3 4 2</td>
</tr>
<tr>
<td>1 2 2 3 4 0</td>
</tr>
<tr>
<td>3 1 3 2 1 2</td>
</tr>
<tr>
<td>5 3 4 3 0 0</td>
</tr>
</tbody>
</table>

1. Make a line plot for the data.

2. How many televisions do most families own?

3. What is the greatest number of televisions owned by a family?

4. What is the range of the data?

5. Identify any clusters, gaps, or outliers, if any exist, and explain what they mean.

6. Describe how the range of the data would change if 5 were not part of the data set.
Enrichment

Enhanced Line Plots

You have learned to create line plots to analyze given data. Sometimes altering a line plot can show even more information about a data set.

SPORTS For Exercises 1–4, use the following data about the Super Bowl.

The National Football League began choosing its champion in the Super Bowl in 1967. The list below shows the margin of victory and the winning league for the first 40 Super Bowl games. In the list, A indicates that the winning team is from the American Football Conference (AFC), N indicates that the winning team is from the National Football Conference.

<table>
<thead>
<tr>
<th>Year</th>
<th>Margin</th>
<th>Year</th>
<th>Margin</th>
<th>Year</th>
<th>Margin</th>
<th>Year</th>
<th>Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25-N</td>
<td>11</td>
<td>18-A</td>
<td>21</td>
<td>19-N</td>
<td>31</td>
<td>14-N</td>
</tr>
<tr>
<td>2</td>
<td>19-N</td>
<td>12</td>
<td>17-N</td>
<td>22</td>
<td>32-N</td>
<td>32</td>
<td>7-A</td>
</tr>
<tr>
<td>3</td>
<td>9-A</td>
<td>13</td>
<td>4-A</td>
<td>23</td>
<td>4-N</td>
<td>33</td>
<td>15-A</td>
</tr>
<tr>
<td>4</td>
<td>16-A</td>
<td>14</td>
<td>12-A</td>
<td>24</td>
<td>45-N</td>
<td>34</td>
<td>7-N</td>
</tr>
<tr>
<td>5</td>
<td>3-A</td>
<td>15</td>
<td>17-A</td>
<td>25</td>
<td>1-N</td>
<td>35</td>
<td>27-A</td>
</tr>
<tr>
<td>6</td>
<td>21-N</td>
<td>16</td>
<td>5-N</td>
<td>26</td>
<td>13-N</td>
<td>36</td>
<td>3-A</td>
</tr>
<tr>
<td>7</td>
<td>7-A</td>
<td>17</td>
<td>10-N</td>
<td>27</td>
<td>35-N</td>
<td>37</td>
<td>27-N</td>
</tr>
<tr>
<td>8</td>
<td>17-A</td>
<td>18</td>
<td>29-A</td>
<td>28</td>
<td>17-N</td>
<td>38</td>
<td>3-A</td>
</tr>
<tr>
<td>9</td>
<td>10-A</td>
<td>19</td>
<td>22-N</td>
<td>29</td>
<td>23-N</td>
<td>39</td>
<td>3-A</td>
</tr>
<tr>
<td>10</td>
<td>4-A</td>
<td>20</td>
<td>36-N</td>
<td>30</td>
<td>10-N</td>
<td>40</td>
<td>11-A</td>
</tr>
</tbody>
</table>

1. Make a line plot of the numerical data.

2. What do you observe about the winning margins?

3. Make a new line plot for the winning margins by replacing each × with A for an AFC win or N for an NFC win. What do you observe about the winning margins when looking at this enhanced line plot?

4. The list of Super Bowl margins is given in order of years: first 25-N, then 9-N, and so on. Describe any patterns you see in the margins or in the winning league over the years of the Super Bowl.
Spreadsheet Activity

Line Plots

You can use a spreadsheet to create line plots.

**Example**  
Hellen teaches a math class at State University. She wants to look at the relationship between the number of days a student misses class out of 20 classes and the average grades. Create a line plot from the data to the right.

**Step 1**  
Enter the days missed in the first column and the average grade in the second column. Press ENTER after each day to move to the cell below.

**Step 2**  
Choose the chart wizard from the toolbar. Next, select *XY* (Scatter) and choose scatter with data points connected by lines. Press NEXT, NEXT, NEXT, and FINISH. This will give a line plot of the data.

Note: If the data is not in descending order, first sort the data so that it is.

---

**Answer the following questions.**

1. Does there appear to be a relationship between the number of classes missed and the average grades?

2. What advice would you give to a student in one of Hellen’s classes?

3. Research the population of your state for 10 years and using a spreadsheet create a line plot with the data.
Lesson Reading Guide

Measures of Central Tendency and Range

Get Ready for the Lesson

Complete the Mini Lab at the top of page 402 in your textbook. Write your answers below.

1. What was the average score for the five quizzes.

2. If the quiz score of 14 points is added to the data, how many pennies would be in each cup?

Read the Lesson

3. Look at the data set 2, 5, 5, 6, 8, 11, 12. What is the mean? the median? the mode?

4. Match the measure of central tendency with the description of when it would be most useful.

   median ___________ a. The data set has many identical numbers.

   mean ____________ b. There are no big gaps in the middle of the data.

   mode ____________ c. The data set has no outliers.

5. If you wanted to find the average height of all of the students in a classroom, which would be the most accurate to use—mean, median, or mode? Why?

Remember What You Learned

6. In baseball, a player has a batting average. What does this average measure? What kind of data would you need to calculate a batting average?
**Example**

The table shows the number of hours students spent practicing for a music recital. Find the mean, median, and mode of the data.

<table>
<thead>
<tr>
<th>Numbers of Hours Spent Practicing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
</tr>
<tr>
<td>18</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>8</td>
</tr>
</tbody>
</table>

The mean is the sum of the data divided by the number of data items. The median is the middle number of the ordered data, or the mean of the middle two numbers. The mode is the number (or numbers) that occur most often. The mean, median, and mode are each measures of central tendency.

\[
\text{mean} = \frac{3 + 12 + 10 + \ldots + 12}{20} = \frac{160}{20} = 8
\]

To find the median, the data must be ordered.

0, 1, 2, 3, 3, 5, 6, 7, 8, 8, 8, 9, 10, 10, 11, 12, 12, 12, 15, 18

\[
\frac{8 + 8}{2} = 8
\]

To find the mode, look for the number that occurs most often. Since 8 and 12 each occur 3 times, the modes are 8 and 12.

**Exercises**

Find the mean, median, and mode for each set of data. Round to the nearest tenth if necessary.

1. 27, 56, 34, 19, 41, 56, 27, 25, 34, 56

2. 7, 3, 12, 4, 6, 3, 4, 8, 7, 3, 20

3. 1, 23, 4, 6, 7, 20, 7, 5, 3, 4, 6, 7, 11, 6

4. 3, 3, 3, 3, 3, 3, 3

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

6. 4, 0, 12, 10, 0, 5, 7, 16, 12, 10, 12, 12
Skills Practice

Measures of Central Tendency and Range

Find the mean, median, and mode for each set of data. Round to the nearest tenth if necessary.

1. 5, 9, 6, 6, 11, 8, 4
2. 1, 3, 5, 2, 4, 8, 4, 7, 2

3. 1, 9, 4, 7, 5, 3, 16, 11
4. 3, 4, 4, 4, 4, 3, 6

5. 3, 7, 2, 5, 6, 5, 10, 11, 5
6. 19, 17, 24, 11, 19, 25, 15, 15, 16, 16

7. 5, 8, 9, 9, 12, 6, 4
8. 3, 4, 9, 7, 6, 6, 2

9. 

10. 

11. 

12. 

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Find the mean, median, and mode for each set of data. Round to the nearest tenth if necessary.

1. Number of parking spaces used: 45, 39, 41, 45, 44, 64, 51

2. Prices of plants: $10, $8, $20, $25, $14, $39, $10, $10, $8, $16

3. Points scored during football season: 14, 20, 3, 9, 18, 35, 21, 24, 31, 12, 7

4. Golf scores: –3, –2, +1, +1, –1, –1, +2, –5

5. Percent increase: 3.3, 4.1, 3.9, 5.0, 3.5, 2.9, 3.9

6. Dollars Spent Shopping

7. CHILDREN The table shows the number of children living at home in a neighborhood of 24 homes. Which measure best describes the data: mean, median, or mode? Explain.

<table>
<thead>
<tr>
<th>Children at Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 1 3 0 4 4 1 2</td>
</tr>
<tr>
<td>0 6 2 2 5 0 2 3</td>
</tr>
<tr>
<td>3 1 1 4 2 0 1 4</td>
</tr>
</tbody>
</table>

8. WORK The table shows the hours Sam worked each week during the summer. How many hours did he work during the twelfth week to average 20 hours per week?

<table>
<thead>
<tr>
<th>Hours Worked</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 24 20 19 15 21</td>
</tr>
<tr>
<td>20 19 18 22 22 ?</td>
</tr>
</tbody>
</table>
8-2 Word Problem Practice

Measures of Central Tendency and Range

SCHOOL For Exercises 1–6, use the table below. It shows the number of times per day that students go to their lockers.

<table>
<thead>
<tr>
<th>Student Locker Visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 2 0 1 2 2 3 4</td>
</tr>
<tr>
<td>0 5 2 5 2 5 2 4</td>
</tr>
<tr>
<td>2 4 6 4 5 6 5 2</td>
</tr>
<tr>
<td>2 2 0 1 4 6 10 2</td>
</tr>
</tbody>
</table>

1. Make a frequency table of the data.

2. What is the range of the data?

3. Find the mean, median, and mode of the data. Round to the nearest tenth if necessary.

4. Would the mean, median, or mode best represent the data? Explain.

5. Explain why the mean does not best represent the data.

6. If the value 10 were dropped from the data, find the median and the mode of the remaining data.
### Quartiles

The median is a number that describes the “center” of a set of data. Here are two sets with the same median, 50, indicated by □.

| 25 30 35 40 45 □ 50 55 60 △ 65 70 75 |
| 0 10 △ 20 40 50 □ 50 60 70 △ 80 90 100 |

But, sometimes a single number may not be enough. The numbers shown in the triangles can also be used to describe the data. They are called **quartiles**. The lower quartile is the median of the lower half of the data. It is indicated by □. The upper quartile is the median of the upper half. It is indicated by △.

**Circle the median in each set of data. Draw triangles around the quartiles.**

1. 29 52 44 37 27 46 43 60 31 54 36
2. 1.7 0.4 1.4 2.3 0.3 2.7 2.0 0.9 2.7 2.6 1.2
3. 1,150 1,600 1,450 1,750 1,500 1,300 1,200
4. 5 2 9 7 9 3 7 8 7 2 5 6 9 5 1

### Use the following set of test scores to solve the problems.

71 57 29 37 53 41 25 37 53 27
62 55 75 48 66 53 66 48 75 66

5. Which scores are “in the lower quartile”?

6. How high would you have to score to be “in the upper quartile”?
8-2  TI-73 Activity

Finding the Mean

You can use two different methods to find the mean (average) of a set of data with your calculator.

Method A  Add the data values and divide by the number of values.

Method B  Enter the data in a list and then use the Mean function.

Step 1  Clear all lists.  

Step 2  Open the List feature.  

Step 3  Enter data in L1. 

Press ENTER after each data value.

Step 4  Return to the Home screen.  

Step 5  Find the mean. 

Find the mean temperature for each city in the table below. Round each answer to the nearest tenth.

<table>
<thead>
<tr>
<th>City</th>
<th>Seattle, WA</th>
<th>Denver, CO</th>
<th>El Paso, TX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan.</td>
<td>39.1</td>
<td>29.5</td>
<td>44.2</td>
</tr>
<tr>
<td>Feb.</td>
<td>42.8</td>
<td>33.5</td>
<td>48.4</td>
</tr>
<tr>
<td>Mar.</td>
<td>44.2</td>
<td>38.0</td>
<td>55.0</td>
</tr>
<tr>
<td>Apr.</td>
<td>48.7</td>
<td>47.4</td>
<td>63.6</td>
</tr>
<tr>
<td>May</td>
<td>55.0</td>
<td>57.2</td>
<td>71.8</td>
</tr>
<tr>
<td>June</td>
<td>60.2</td>
<td>67.0</td>
<td>80.8</td>
</tr>
<tr>
<td>July</td>
<td>64.8</td>
<td>73.3</td>
<td>82.5</td>
</tr>
<tr>
<td>Aug.</td>
<td>64.1</td>
<td>71.4</td>
<td>80.3</td>
</tr>
<tr>
<td>Sept.</td>
<td>60.0</td>
<td>62.6</td>
<td>74.1</td>
</tr>
<tr>
<td>Oct.</td>
<td>52.4</td>
<td>51.9</td>
<td>63.6</td>
</tr>
<tr>
<td>Nov.</td>
<td>44.8</td>
<td>38.8</td>
<td>51.4</td>
</tr>
<tr>
<td>Dec.</td>
<td>41.0</td>
<td>32.5</td>
<td>44.4</td>
</tr>
</tbody>
</table>

1. The mean temperature of the coldest month in a city with a *subtropical climate* is between 27°F and 64°F. Do any of the cities in the table above have a subtropical climate? If so, which ones?

2. In a *polar climate*, the mean temperature of the warmest month is less than 50°F. Do any of the cities in the table have a polar climate?
Lesson Reading Guide

8-3

Stem-and-Leaf Plots

Get Ready for the Lesson

Read the introduction at the top of page 410 in your textbook. Write your answers below.

1. Which chick weight is the lightest?

2. How many of the weights are less than 10 grams?

Read the Lesson

3. What can you determine easily from a stem-and-leaf plot?

4. How do you determine the stems of a stem-and-leaf plot? How do you determine the leaves?

5. If you look at a stem-and-leaf plot, how can you tell what the stems and leaves represent?

Remember What You Learned

6. Describe how the arrangement of stems and leaves in a stem-and-leaf plot relates to a plant or tree.
8-3

Study Guide and Intervention

Stem-and-Leaf Plots

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

**Example**

Make a stem-and-leaf plot of the data below. Then find the range, median, and mode of the data.

42, 45, 37, 46, 35, 49, 47, 35, 45, 63, 45

Order the data from least to greatest.

35, 35, 37, 42, 45, 45, 45, 46, 47, 49, 63

The least value is 35, and the greatest value is 63. So, the tens digits form the stems, and the ones digits form the leaves.

range: greatest value – least value = 63 – 35 = 28
median: middle value, or 45
mode: most frequent value, or 45

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>5 5 7</td>
</tr>
<tr>
<td>4</td>
<td>2 5 5 5 6 7 9</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

6 | 3 = 63

**Exercises**

Make a stem-and-leaf plot for each set of data. Then find the range, median, and mode of the data.

1. 15, 25, 16, 28, 1, 27, 16, 19, 28
2. 1, 2, 3, 2, 3, 1, 4, 2, 5, 7, 12, 11, 11, 3, 10
3. 3, 5, 1, 17, 11, 45, 17
4. 4, 7, 10, 5, 8, 12, 7, 6
Skills Practice

Stem-and-Leaf Plots

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

1. 23, 36, 25, 13, 24, 25, 32, 33, 17, 26, 24

2. 3, 4, 6, 17, 12, 5, 17, 4, 26, 17, 18, 21, 16, 15, 20

3. 26, 27, 23, 23, 24, 26, 31, 45, 33, 32, 41

4. 347, 334, 346, 330, 348, 347, 359, 344, 357, 40, 21, 20

HOT DOGS

For Exercises 5–7, use the stem-and-leaf plot at the right that shows the number of hot dogs eaten during a contest.

5. How many hot dogs are represented on the stem-and-leaf plot?

6. What is the range of the number of hot dogs eaten?

7. Find the median and mode of the data.

Determine the mean, median, and mode of the data shown in each stem-and-leaf plot.

8. Stem | Leaf
   0 | 1 2 2 3
   1 | 3 4 5 5
   2 | 0 0 0 1 3
   2 | 0 = 20

9. Stem | Leaf
   2 | 0 0 0 2 3 5 7
   3 | 1 2
   4 | 0
   4 | 0 = 40

10. Stem | Leaf
    22 | 1 1 2 7
    23 | 3 3 9
    24 | 0 6 8
    24 | 0 = 240

11. Stem | Leaf
    0 | 1 3 3 4 7
    1 | 2 2 2 4 5 6
    2 | 0 0 0 1
    2 | 0 = 20
Practice

Stem-and-Leaf Plots

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

1. | Test Scores
   | 78 99 83 92 90
   | 94 88 88 94 87
   | 70 86 85 86 93

2. | Weight of Male Lions (pounds)
   | 440 425 452 433
   | 445 436 440 475
   | 426 444 455 485
   | 437 450 466 470

GOLD MEDALS For Exercises 3–5, use the stem-and-leaf plot that shows the number of gold medals won by each of the top 15 countries at the 2004 Summer Olympics.

3. Find the range of gold medals won.

4. Find the median and the mode of the data.

5. Based on the data, write one inference that can be made about the data.

PRESIDENTS For Exercises 6–10, use the stem-and-leaf plot that shows the age of each United States President at inauguration.

6. How many presidents were under the age of 45 when inaugurated?

7. Find the ages of the youngest and oldest president at inauguration.

8. Find the range of the data.

9. Find the median and the mode of the data

10. Based on the data, in what age group were the majority of the presidents when inaugurated?
ENDANGERED SPECIES  For Exercises 1–6, use the table below. It shows the number of endangered species in the U.S.

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>mammals</td>
<td>63</td>
</tr>
<tr>
<td>birds</td>
<td>78</td>
</tr>
<tr>
<td>reptiles</td>
<td>14</td>
</tr>
<tr>
<td>amphibians</td>
<td>10</td>
</tr>
<tr>
<td>fishes</td>
<td>70</td>
</tr>
<tr>
<td>clams</td>
<td>61</td>
</tr>
<tr>
<td>snails</td>
<td>20</td>
</tr>
<tr>
<td>insects</td>
<td>33</td>
</tr>
<tr>
<td>arachnids</td>
<td>12</td>
</tr>
<tr>
<td>crustaceans</td>
<td>18</td>
</tr>
</tbody>
</table>

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

2. What group has the greatest number of endangered species in the U.S.?

3. What group has the least number of endangered species in the U.S.?

4. What is the range of the data?

5. Use your stem-and-leaf plot to determine the median and mode.

6. How many groups have less than 30 endangered species in the U.S.?
Back-to-Back Stem-and-Leaf Plots

You can use a **back-to-back stem-and-leaf plot** 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.

**MARKETING** For Exercises 1 and 2, use the following data about advertising to preteens and teens.

Advertisers decide when to advertise their products on television based on when the people who are likely to buy will be watching. The table shows the percents of boys and girls ages 6 to 14 who watch television at different times of day. (Values are rounded to the nearest percent.)

<table>
<thead>
<tr>
<th>Time</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday–Friday, 6 A.M.–9 A.M.</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Monday–Friday, 3 P.M.–5 P.M.</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>Monday–Friday, 5 P.M.–8 P.M.</td>
<td>30</td>
<td>29</td>
</tr>
<tr>
<td>Monday–Saturday, 8 P.M.–10 P.M. and Sunday, 7 P.M.–10 P.M.</td>
<td>29</td>
<td>27</td>
</tr>
<tr>
<td>Saturday, 6 A.M.–8 A.M.</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Saturday, 8 A.M.–1 P.M.</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>Saturday, 1 P.M.–5 P.M.</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Saturday, 5 P.M.–8 P.M.</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Sunday, 6 A.M.–8 A.M.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Sunday, 8 A.M.–1 P.M.</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Sunday, 1 P.M.–5 P.M.</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Sunday, 5 P.M.–7 P.M.</td>
<td>15</td>
<td>9</td>
</tr>
</tbody>
</table>

1. Make a back-to-back stem-and-leaf plot of the data by recording the data about boys on the left side of the stems and recording the data about girls on the right side of the stems. Who watches television more often, boys or girls?

2. If you were scheduling advertising for a product aimed at pre-teen girls, when would you advertise? Explain your reasoning.
Get Ready for the Lesson

Read the introduction at the top of page 415 in your textbook. Write your answers below.

1. What are the fastest and slowest speeds in the table?

2. How can you create a visual representation to summarize the data?

3. Do any of these representations show both the animal name and its speed?

Read the Lesson

4. Look at Example 1. What are the things that a bar graph should have?

5. Why are all of the bars in a histogram the same width without space between them?

Remember What You Learned

6. How is a histogram similar to a bar graph? How is it different?
8-4
Study Guide and Intervention
Bar Graphs and Histograms

A bar graph is one method of comparing data by using solid bars to represent quantities. A histogram is a special kind of bar graph. It uses bars to represent the frequency of numerical data that have been organized into intervals.

Example 1  SIBLINGS Make a bar graph to display the data in the table below.

<table>
<thead>
<tr>
<th>Student</th>
<th>Number of Siblings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sue</td>
<td>1</td>
</tr>
<tr>
<td>Isfu</td>
<td>6</td>
</tr>
<tr>
<td>Margarita</td>
<td>3</td>
</tr>
<tr>
<td>Akira</td>
<td>2</td>
</tr>
</tbody>
</table>

Step 1  Draw a horizontal and a vertical axis. Label the axes as shown. Add a title.
Step 2  Draw a bar to represent each student. In this case, a bar is used to represent the number of siblings for each student.

Example 2  SIBLINGS The number of siblings of 17 students have been organized into a table. Make a histogram of the data.

<table>
<thead>
<tr>
<th>Number of Siblings</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–1</td>
<td>4</td>
</tr>
<tr>
<td>2–3</td>
<td>10</td>
</tr>
<tr>
<td>4–5</td>
<td>2</td>
</tr>
<tr>
<td>6–7</td>
<td>1</td>
</tr>
</tbody>
</table>

Step 1  Draw and label horizontal and vertical axes. Add a title.
Step 2  Draw a bar to represent the frequency of each interval.

Exercises

1. Make a bar graph for the data in the table.

<table>
<thead>
<tr>
<th>Student</th>
<th>Number of Free Throws</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luis</td>
<td>6</td>
</tr>
<tr>
<td>Laura</td>
<td>10</td>
</tr>
<tr>
<td>Opal</td>
<td>4</td>
</tr>
<tr>
<td>Gad</td>
<td>14</td>
</tr>
</tbody>
</table>

2. Make a histogram for the data in the table.

<table>
<thead>
<tr>
<th>Number of Free Throws</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–1</td>
<td>1</td>
</tr>
<tr>
<td>2–3</td>
<td>5</td>
</tr>
<tr>
<td>4–5</td>
<td>10</td>
</tr>
<tr>
<td>6–7</td>
<td>4</td>
</tr>
</tbody>
</table>
Skills Practice

Bar Graphs and Histograms

ZOOS For Exercises 1 and 2, use the table. It shows the number of species at several zoological parks.

1. Make a bar graph of the data.

<table>
<thead>
<tr>
<th>Zoo</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>350</td>
</tr>
<tr>
<td>Lincoln Park</td>
<td>290</td>
</tr>
<tr>
<td>Cincinnati</td>
<td>700</td>
</tr>
<tr>
<td>Bronx</td>
<td>530</td>
</tr>
<tr>
<td>Oklahoma City</td>
<td>600</td>
</tr>
</tbody>
</table>

2. Which zoological park has the most species?

ZOOS For Exercises 3 and 4, use the table at the right. It shows the number of species at 37 major U.S. public zoological parks.


<table>
<thead>
<tr>
<th>Number of Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 700 290 600 681</td>
</tr>
<tr>
<td>300 643 350 794 400</td>
</tr>
<tr>
<td>360 600 134 200 800</td>
</tr>
<tr>
<td>305 384 500 330 250</td>
</tr>
<tr>
<td>530 715 303 200 475</td>
</tr>
<tr>
<td>465 340 347 300 708</td>
</tr>
<tr>
<td>184 800 375 350 450</td>
</tr>
<tr>
<td>337 221</td>
</tr>
</tbody>
</table>

4. Which interval has the largest frequency?

HEALTH For Exercises 5 and 6, use the graph at the right.

5. What does each bar represent?

6. Determine whether the graph is a bar graph or a histogram. Explain how you know.
Practice

Bar Graphs and Histograms

Select the appropriate graph to display each set of data: bar graph or histogram. Then display the data in the appropriate graph.

1. Ages of Children Taking Swimming Lessons

<table>
<thead>
<tr>
<th>Age</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–2</td>
<td>8</td>
</tr>
<tr>
<td>3–5</td>
<td>12</td>
</tr>
<tr>
<td>6–8</td>
<td>18</td>
</tr>
<tr>
<td>9–11</td>
<td>17</td>
</tr>
<tr>
<td>12–14</td>
<td>12</td>
</tr>
<tr>
<td>15–17</td>
<td>13</td>
</tr>
</tbody>
</table>

2. Home Run Derby 2005 Round 1 Home Runs

<table>
<thead>
<tr>
<th>Player</th>
<th>Home Runs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bobby Abreu</td>
<td>24</td>
</tr>
<tr>
<td>Ivan Rodriguez</td>
<td>7</td>
</tr>
<tr>
<td>Carlos Lee</td>
<td>11</td>
</tr>
<tr>
<td>David Ortiz</td>
<td>17</td>
</tr>
<tr>
<td>Hee-Seop Choi</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: baseball-almanac.com

PET OWNERSHIP  For Exercises 3–5, use the bar graph that shows the percent of households that owned fish or birds for the years 1998, 2000, 2002, and 2004.

3. Which type of pet increased in percent ownership from 1998 to 2004?

4. For every 100 households, how many more households had fish for pets than birds in the year 1998?

5. During which years did the percent ownership not change for either type of pet?
PUPPIES  For Exercises 1 and 2, use the table below. It shows the results of a survey in which students were asked what name they would most like to give a new pet puppy.

<table>
<thead>
<tr>
<th>Name</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max</td>
<td>15</td>
</tr>
<tr>
<td>Tiger</td>
<td>5</td>
</tr>
<tr>
<td>Lady</td>
<td>13</td>
</tr>
<tr>
<td>Shadow</td>
<td>10</td>
</tr>
<tr>
<td>Molly</td>
<td>9</td>
</tr>
<tr>
<td>Buster</td>
<td>2</td>
</tr>
</tbody>
</table>

EARTH SCIENCE  In Exercises 3–6, use the table below. It shows the highest wind speeds in 30 U.S. cities.

<table>
<thead>
<tr>
<th>Highest Wind Speeds (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
</tr>
<tr>
<td>53</td>
</tr>
<tr>
<td>57</td>
</tr>
</tbody>
</table>

1. Make a bar graph to display the data.

   **Favorite New Puppy Names**

2. Use your bar graph from Exercise 1. Compare the number of votes the name Shadow received to the number of votes the name Tiger received.

3. Make a histogram of the data.

   **Highest Wind Speeds**

4. What is the top wind speed of most of the cities?

5. How many cities recorded wind speeds of 80 miles per hour or more?

6. How many cities recorded their highest wind speeds at 60 miles per hour or more?
Bar Graphs and Histograms

You can use a bar graph to compare different data sets. Bar graphs can be used to show categorical data. Solid bars are used to show the values in certain categories. You can use a histogram, which is a special kind of bar graph, to represent numerical data. It shows how many data points are within certain numerical intervals.

1. These two bar graphs show the same data from the Smith family’s 5-day road trip. Describe what each graph is showing and give each graph a title. Which graph is a histogram?

   ![Bar Graph 1](image1)
   ![Bar Graph 2](image2)

2. The following two graphs show the amount of time that the family spent driving during the same road trip. Use the bar graph on the left to create a histogram on the right. Provide a title for each graph.

   ![Bar Graph 3](image3)
   ![Histogram](image4)

3. Use the graphs to determine the average speed the Smith family drove on Wednesday.
8-5

Study Guide and Intervention

Problem-Solving Investigation: Use a Graph

When solving problems, a graph can show a visual representation of the situation and help you make conclusions about the particular set of data.

Example

POPULATION The table below shows the enrollment of Mill High School students over five years. Estimate the enrollment for the 2005–2006 school year.

<table>
<thead>
<tr>
<th>Mill High School Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>00–01</td>
</tr>
<tr>
<td>115</td>
</tr>
</tbody>
</table>

Explore You know the enrollment of students for five years. You need to estimate the enrollment for the 2005–2006 school year.

Plan Organize the data in a graph so that you can see a trend in the enrollment levels.

Solve

The graph shows that the enrollment increases over the years. By using the graph you can conclude that Mill High School had about 225 students enrolled for the 2005–2006 school year.

Check Draw a line through as close to as many points as possible. The estimate is close to the line so the answer is reasonable.

Exercises

1. TEMPERATURE The chart to the right shows the average December temperatures in Fahrenheit over four years. Predict the average temperature for the next year.

2. POPULATION Every five years the population of your neighborhood is recorded. What do you predict the population will be in 2010?
Use a graph to solve the problem. For Exercises 1–3, refer to the graph.

1. Estimate the temperature at which the rate of chirping is 130 per minute.

2. Predict the number of cricket chirps per minute at 86 degrees.

3. Predict the number of chirps per minute at 90 degrees.

For Exercises 4–6, refer to the graph.

4. How many students consider Friday their favorite day of the week?

5. How many students prefer the weekend days?

6. How many students are in Kenny’s class?
Practice

Problem-Solving Investigation: Use a Graph

Mixed Problem Solving

PITCHING For Exercises 1 and 2, use the graph that shows the amount of pitching practice time for Adam and Jordan during a particular week.

1. Who practiced more during the week and by how much time?

2. What was Adam’s average practice time per day for the five days?

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

<table>
<thead>
<tr>
<th>PROBLEM-SOLVING STRATEGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use the four-step plan.</td>
</tr>
<tr>
<td>• Guess and check.</td>
</tr>
<tr>
<td>• Look for a pattern.</td>
</tr>
<tr>
<td>• Make a graph.</td>
</tr>
</tbody>
</table>

3. LAWN TOOLS The bar graph shows the number of shovels and rakes sold during particular months at a hardware store. During which month was the number of rakes sold about twice the number of shovels sold?

4. NUMBER THEORY 42 is subtracted from 42% of a number. The result is 42. What is the number?

Select the Operation

For Exercises 5 and 6, select the appropriate operation(s) to solve the problem. Justify your solution(s) and solve the problem.

5. MONEY The value of the number of dimes is equal to the value of the number of quarters. If the total value of the quarters and dimes is $6.00, find the total number of coins.

6. SKIING Mrs. Roget is taking her family of 2 adults and 4 children skiing for the day. They need to rent ski equipment. What will it cost to ski for the day including equipment rental and lift tickets?

<table>
<thead>
<tr>
<th>Daily Ski Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
</tr>
<tr>
<td>Left Ticket</td>
</tr>
<tr>
<td>Skis</td>
</tr>
<tr>
<td>Boots</td>
</tr>
<tr>
<td>Poles</td>
</tr>
</tbody>
</table>
Solve. Use any strategy.

For exercises 1–3, use the graph below. Maria’s class is selling pizzas as a fundraiser for their upcoming fieldtrip to the zoo.

1. Which student sold the most pizzas?

2. Did the girls sell more pizzas than the boys?

3. How many pizzas total did the class sell?

4. EXERCISE Robert wants to begin a new exercise program. His goal is to begin by exercising for 20 minutes. He goes to the gym two times a week, increasing his workout by five minutes each time. How long will it take him to work up to an hour?

For Exercises 5 and 6 use the following information.

MONEY Brianna made a $13.82 purchase at the grocery store. She received two bills and five coins in change.

5. What denomination of bill did she pay with?

6. What bills and coins did she receive as change?

7. NUMBER THEORY A number is multiplied by 32 then divided by 14. The square root of the result is 4. What is the number?

8. PIZZA Joelle has her choice of five pizza toppings: onions, sausage, mushrooms, pepperoni, and green pepper. In order to get a special price, she can only choose two toppings. How many combinations of toppings could she choose?
Get Ready for the Lesson

Complete the Mini-Lab at the top of page 426 in your textbook. Write your answers below.

1. By how much did the water’s height change after each addition of marbles?

2. Predict the height of the water when 30 marbles are in the drinking glass. Explain how you made your prediction.

3. Test your prediction by placing 10 more marbles in the glass.

4. Draw a graph of the data that you recorded in the table.

Read the Lesson

5. In Example 1, what do the dotted lines help in finding?

6. What are the benefits of a scatter plot?

7. How would you know if two sets of data are related when looking at their scatter plot?

Remember What You Learned

8. Discuss line graph and scatter plots in terms of their benefits for making predictions.
Exercises

Use the line graph of the Moralez family car trip shown below to answer the following questions.

1. After 250 miles, how much gas did the Moralez family have left?

Draw a dotted line up from 250 m until it reaches the graph and then find the corresponding gas measure.

They will have about 5.5 g left.

2. How far can the Moralez family travel before they run out of gas?

When they run out of gas, the tank will be at 0 so find where the line reaches 0.

They can travel about 430 miles.

Exercises

Use the scatter plot to answer the questions.

1. How many birds were there in 2004?

2. What relationship do you see between the number of birds and year?

3. Predict the number of birds there were in the year 2001?

4. Predict the number of birds there will be in in the year 2006?

5. In what year do you think the bird population will reach 100?
Determine whether each data set shows a positive, a negative, or no relationship. Then describe the relationship between the data sets.

1. Carolyn's Income
   ![Graph of Carolyn's Income]
   - **x**: Age
   - **y**: Income ($)

2. Studying for Math Test
   ![Graph of Studying for Math Test]
   - **x**: Number of Students
   - **y**: Time (min.)

3. Gas Mileage in Sam's Car
   ![Graph of Gas Mileage in Sam's Car]
   - **x**: Speed
   - **y**: Gas Mileage

4. Crickets Chirping
   ![Graph of Crickets Chirping]
   - **x**: Temperature
   - **y**: Number of Chirps per minute

5. Joseph's Pets
   ![Graph of Joseph's Pets]
   - **x**: Age
   - **y**: Number of Pets

6. Ryan's Physical Activity
   ![Graph of Ryan's Physical Activity]
   - **x**: Age
   - **y**: Physical Activity
WATER LEVEL  For Exercises 1 and 2, use the graph that shows the level of rising water of a lake after several days of rainy weather.

1. If the water continues to rise, predict the day when the water level will be above flood stage of 20.5 feet.

2. How many days did it take for the water level to rise 4 feet?

PROPERTY  For Exercises 3–5, use the table that shows the property value per acre for five years.

3. Make a scatter plot of the data. Use the time on the horizontal axis and the property value on the vertical axis.

<table>
<thead>
<tr>
<th>Year</th>
<th>Value (per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>$14,000</td>
</tr>
<tr>
<td>2002</td>
<td>$16,600</td>
</tr>
<tr>
<td>2003</td>
<td>$18,900</td>
</tr>
<tr>
<td>2004</td>
<td>$21,500</td>
</tr>
<tr>
<td>2005</td>
<td>$24,000</td>
</tr>
</tbody>
</table>

4. Describe the relationship, if any, between the two sets of data.

5. Predict the property value per acre in 2006.
For Exercises 1–3, use the table that shows the relationship between the month of the year and the number of Tamika’s classmates that have their driving permit.

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1</td>
</tr>
<tr>
<td>February</td>
<td>3</td>
</tr>
<tr>
<td>March</td>
<td>4</td>
</tr>
<tr>
<td>April</td>
<td>5</td>
</tr>
<tr>
<td>May</td>
<td>8</td>
</tr>
<tr>
<td>June</td>
<td>10</td>
</tr>
<tr>
<td>July</td>
<td>11</td>
</tr>
<tr>
<td>August</td>
<td>14</td>
</tr>
<tr>
<td>September</td>
<td>15</td>
</tr>
<tr>
<td>October</td>
<td>15</td>
</tr>
<tr>
<td>November</td>
<td>18</td>
</tr>
<tr>
<td>December</td>
<td>21</td>
</tr>
</tbody>
</table>

1. Make a scatter plot of the data. Put the months on the horizontal axis and the number of students on the vertical axis.

2. Describe the type of relationship there is between the two types of data.

3. Why do you think this relationship exists?

For Exercises 4–6, use the graph that shows the time it takes Taylor to complete a marathon.

4. Predict the time it will take Taylor to reach Mile 22 of the marathon and how long it will take Taylor to complete the marathon.

5. For how many minutes will he have run when he reaches the 8-mile mark?

6. How many miles will he have run in 110 minutes?
Periodic Relationships

You have studied scatter plots that demonstrate positive, negative, or no relationship. A periodic relationship is another way that two variables can be related. Periodic relationships contain patterns that repeat over time. For example, average monthly temperatures vary on a yearly basis. The table at the right shows the average daily high temperature for each month in Los Angeles and Boston.

1. Draw a scatter plot of the data for each city on the axes below. Use a different symbol for each city (for example, an x for Los Angeles temperatures and an • for Boston temperatures).

2. Describe the trend in the data for the monthly average temperature in Boston.

3. Draw a curved line on the graph that demonstrates the trend in the data.

4. What will happen between month 12 and month 24? Describe what you think will happen for each city, and draw curved lines on the graph above to demonstrate the trends.

<table>
<thead>
<tr>
<th>Month</th>
<th>Los Angeles</th>
<th>Boston</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>64</td>
<td>36</td>
</tr>
<tr>
<td>2</td>
<td>63</td>
<td>39</td>
</tr>
<tr>
<td>3</td>
<td>68</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>69</td>
<td>57</td>
</tr>
<tr>
<td>5</td>
<td>76</td>
<td>68</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>78</td>
</tr>
<tr>
<td>8</td>
<td>82</td>
<td>81</td>
</tr>
<tr>
<td>9</td>
<td>81</td>
<td>73</td>
</tr>
<tr>
<td>10</td>
<td>76</td>
<td>65</td>
</tr>
<tr>
<td>11</td>
<td>71</td>
<td>56</td>
</tr>
<tr>
<td>12</td>
<td>66</td>
<td>46</td>
</tr>
</tbody>
</table>

Source: www.wrh.noaa.gov
Get Ready for the Lesson

1. Can you tell how many were surveyed? Explain.

2. Describe how you could use the graph to predict how many students in your school have no television in their bedroom.

Read the Lesson

3. Look up the word random in a dictionary. Write the meaning of the word as it is used in this lesson.

4. In order to make predictions about a group of people, what do you need to know, according to this lesson?

5. What are two methods for calculating a prediction about a population?

Helping You Remember

6. Take a survey of your class, such as how many people are wearing blue today. Be sure to gather results from your whole class. Based on your results, make a prediction about all of the students in your grade level at your school. Find out the total number of students in your grade from your teacher or school office.
Using Data to Predict

Example 1 In a survey, 200 people from a town were asked if they thought the town needed more bicycle paths. The results are shown in the table. Predict how many of the 28,000 people in the town think more bicycle paths are needed.

<table>
<thead>
<tr>
<th>More Bicycle Paths Needed?</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>39%</td>
</tr>
<tr>
<td>no</td>
<td>42%</td>
</tr>
<tr>
<td>undecided</td>
<td>19%</td>
</tr>
</tbody>
</table>

Use the percent proportion.

\[
\frac{\text{part of the population}}{\text{whole population}} = \frac{\text{percent}}{100}
\]

Let \(n\) represent the number.

Survey results: \(39\% = \frac{39}{100}\)

\[
\frac{n}{28,000} = \frac{39}{100}
\]

Cross products

\[
100n = 28,000 \times 39
\]

Simplify.

\[
n = 10,920
\]

So, about 10,920 people in the town think more bicycle paths are needed.

Exercises

1. **VOTES** In a survey of voters in Binghamton, 55% of those surveyed said they would vote for Armas for city council. If 24,000 people vote in the election, about how many will vote for Armas?

2. **LUNCH** A survey shows that 43% of high school and middle school students buy school lunches. If a school district has 2,900 high school and middle school students, about how many buy school lunches?

3. **CLASS TRIP** Students of a seventh grade class were surveyed to find out how much they would be willing to pay to go on a class trip. 24% of the students surveyed said they would pay $21 to $30. If there are 360 students in the seventh grade class, about how many would be willing to pay for a trip that costs $21 to $30?
Skills Practice

Using Data to Predict

**CELL PHONES** For Exercises 1–3, use the table at the right. It shows the results of a survey in which students 12 to 17 years old were asked how often they use a cell phone.

<table>
<thead>
<tr>
<th>Frequency of Use</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>more than twice a week</td>
<td>32%</td>
</tr>
<tr>
<td>once or twice a week</td>
<td>16%</td>
</tr>
<tr>
<td>once or twice a month</td>
<td>23%</td>
</tr>
<tr>
<td>less than once a month</td>
<td>12%</td>
</tr>
<tr>
<td>never used one</td>
<td>17%</td>
</tr>
</tbody>
</table>

1. Out of 215 students 12 to 17 years old, how many would you predict use a cell phone once or twice a week?

2. Predict how many students 12 to 17 years old in a group of 375 have never used a cell phone.

3. How many students 12 to 17 years old out of 1,200 would you expect use a cell phone at least once or twice a week?

**PIZZA** For Exercises 4–6, use the table at the right. It shows the results of a survey in which a random sample of seventh graders at Kiewit Middle School were asked to name their favorite pizza topping.

<table>
<thead>
<tr>
<th>Pizza Topping</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>pepperoni</td>
<td>46%</td>
</tr>
<tr>
<td>peppers</td>
<td>28%</td>
</tr>
<tr>
<td>olives</td>
<td>8%</td>
</tr>
<tr>
<td>onions</td>
<td>2%</td>
</tr>
<tr>
<td>pineapple</td>
<td>4%</td>
</tr>
<tr>
<td>mushrooms</td>
<td>12%</td>
</tr>
</tbody>
</table>

4. There are 32 students in Mrs. Chen’s seventh grade class. Predict how many would choose olives as their favorite topping.

5. There are 210 seventh grade students eating lunch in the cafeteria. How many of them would choose peppers as their favorite topping?

6. Predict how many of the 524 seventh graders at Kiewit Middle School would choose pepperoni as their favorite pizza topping.

7. **BACKPACKS** A survey showed that 78% of students who take a bus to school carry a backpack. Predict how many of the 654 students who take a bus also carry a backpack.
Chapter 8

5. DOGS A survey showed that about 40% of American households own at least one dog. Based on that survey, how many households in a community of 800 households own at least one dog?

CAR REPAIRS For Exercises 6–8, use the graph that shows the percent of all repairs for 3 car repair problems at a car repair shop.

6. Suppose a mechanic repairs 478 cars. Predict how many repairs will be made on transmissions.

7. For every 100 repairs, predict how many more repairs will be made on a brake system problem than on an electrical problem.

8. Predict the percent of repairs that will be one of the three problems in the graph.
Word Problem Practice

Using Data to Predict

1. **SHOES** The table shows the results of a survey in which seventh graders were asked how many pairs of shoes they own. Predict how many of the 632 seventh graders at Seneca West Middle School own more than 7 pairs of shoes.

<table>
<thead>
<tr>
<th>Shoes</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 or less</td>
<td>10%</td>
</tr>
<tr>
<td>4</td>
<td>20%</td>
</tr>
<tr>
<td>5</td>
<td>21%</td>
</tr>
<tr>
<td>6</td>
<td>22%</td>
</tr>
<tr>
<td>7</td>
<td>19%</td>
</tr>
<tr>
<td>more than 7</td>
<td>8%</td>
</tr>
</tbody>
</table>

2. **ACTIVITIES** Of the students listed as members of a high school academic team, 75% were involved in sports, speech, music or debate. If 111 students were listed as part of the teams, how many were involved in sports, speech, music, or debate?

3. **MOVIEGOERS** A research study found that about 63% of people 18 or older who go to the movies at least once a month own a personal computer. Out of 500 people 18 and older who go to the movies once or more a month, how many of them would you expect to own a personal computer?

4. **HAIR** A survey showed that 37% of people 12 to 17 years old use hair gel. Predict how many of the 30 students in Mr. Avalon’s ninth grade class use hair gel.

5. **GRADUATION** A survey of first-year students at North Carolina State University showed that about 73% expect to complete their degree in 4 years. If there are 3,333 first-year students, how many of them expect to complete their degree in 4 years?

6. **INTERNET** A recent survey conducted by the Millard school district showed that 87% of households of students have Internet access at home. If there are 19,000 Millard households, how many have Internet access?
Can You Predict The Future?

Many businesses need to be able to accurately predict the choices their customer will make. Their predictions are often based on survey results of a small population, which they apply to a larger population.

Suppose that school administrators want to know whether new technologies improve student achievement. They ask you to survey the students in your class.

**SURVEY**

1. Which of the following technologies do you have: personal computer, electronic organizer, cellular phone, internet access?
2. Which, if any, do you use to help with your school work?
3. What other technologies do you think might be helpful when completing your school work?

Based on your results from the students in your class, predict the following if there are 212 students in your grade, and a total of 639 students in the school.

**Exercises**

1. How many students in your grade have
   a. a personal computer?  
   b. an electronic organizer? 
   c. a cellular phone?  
   d. internet access?
2. What percent of students in the entire school will have all four of the technologies asked about in the survey?
3. Which technology is used most often to help complete school work? Predict the number of students in your grade that use this technology when completing their school work.
4. Based on the results of your survey, what other type of technology would most students use to complete their school work? How many students in your school would use this technology?
5. Based on the results of your survey, what predictions or recommendations would you make to your school administrators on how to improve student achievement?
Scientific Calculator Activity

Leaving a Tip

The percent function on a calculator can be used to decide how much of a tip to leave a server at a restaurant. It can also be used to determine the total bill for a meal.

Example

The Edwards family had a meal at a local restaurant. The bill was $39.95. There was an 8% meal tax, and they leave a tip of 15% of the bill, not including tax. What was the amount of the tip and the total bill?

The tip is 15% of the bill for the meal.

\[
39.95 \times 15 \text{ [2nd] } [\%] \text{ ENTER} \quad 5.9925
\]

They decided to leave a $6.00 tip.

The total bill is found by adding the tax, the amount of the bill, and the tip.

\[
39.95 \times 8 \text{ [2nd] } [\%] \text{ ENTER} \quad 3.196
\]

The tax is $3.20.

\[
3.20 + 39.95 + 6 \text{ ENTER} \quad 49.15
\]

The total bill was $49.15.

Exercises

Find the amount of the tip and the total bill for each meal. Round your answer for the tip to the nearest dollar. Round your answer for the total bill to the nearest cent.

1. bill: $72
   tip: 12%
   tax: 6%

2. bill: $43
   tip: 15%
   tax: 8%

3. bill: $79.95
   tip: 14%
   tax: 8%

4. bill: $29.95
   tip: 15%
   tax: 7%

5. bill: $99
   tip: 15%
   tax: 9%

6. bill: $129.50
   tip: 10%
   tax: 5%

7. bill: $182.50
   tip: 10%
   tax: 6%

8. bill: $41.00
   tip: 15%
   tax: 7%
Get Ready for the Lesson

Read the introduction at the top of page 438 in your textbook. Write your answers below.

1. Suppose she decides to survey the listeners of a rock radio station. Do you think the results would represent the entire population?

2. Suppose she decides to survey a group of people standing in line for a symphony. Do you think the results would represent the entire population?

3. Suppose she decides to mail a survey to every 100th household in the area. Do you think the results would represent the entire population? Explain.

Read the Lesson

4. Match the type of sample with its example. Put the correct letter on the line.

   a. Every 10th person is given a survey.
   b. Only those who volunteer take a survey.
   c. Names are picked randomly out of a hat.
   d. A store manager surveys his first 20 customers.
   e. 5 residents are randomly surveyed from each floor of a 25 story apartment building.

Remember What You Learned

5. If you are conducting a survey, explain why it is important to have an unbiased sample.
8-8  Study Guide and Intervention

Using Sampling to Predict

Example 1

Look at the following table to determine the favorite sport of middle school students.

<table>
<thead>
<tr>
<th>Favorite Sports of Middle School Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basketball</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

Based on the table, it would appear that soccer is the favorite sport of middle school students. However, suppose the data collected for this survey was taken at a World Cup soccer match. It can then be concluded that our sample is biased because students who are at a soccer match may be more likely to choose soccer as their favorite sport.

To receive an unbiased sample of middle school students, the sports survey could be completed at randomly selected middle schools throughout the country.

Exercises

Determine whether the given situations represent a biased or unbiased sample. Then tell the type of sample.

1. Writers of a popular teen magazine want to write a story about which movies their readers like. The writers decide to interview the first 50 people that walk out of a movie theater.

2. The student council wanted to raise money for their school by selling homemade cookies during lunch time. To find out the favorite kind of cookie for the majority of their school, they conducted a survey. They gave the survey to 20 randomly selected students from each grade level.

3. To determine the most frequently used gas station, a researcher randomly selected every 10th person from a drive-through fast food restaurant and asked them where they last filled up with gas.
Each word in the box is a vocabulary word from lesson 8-8. Use the words to complete the sentences below. Not all of the words will be used.

<table>
<thead>
<tr>
<th>unbiased</th>
<th>voluntary response sample</th>
<th>convenience sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>biased</td>
<td>simple random sample</td>
<td>stratified random sample</td>
</tr>
<tr>
<td>sampling</td>
<td>systematic random sample</td>
<td>valid</td>
</tr>
</tbody>
</table>

1. A ___________________________ is when members of the population are selected because they are easily accessed.

2. The survey is considered ___________________________ when the entire population is represented.

3. It is called a ___________________________ when each person in the population has an equal chance to be selected.

4. When the population is divided into similar, non-overlapping groups and then chosen at random from each group it is said to be ___________________________.

5. If only some members of the population choose to participate in a survey then it would be called a ___________________________.

6. A sample would be considered ___________________________ if one or more parts of the population are favored.

7. If people were selected by a specific time or item interval, such as every 50th person, then this would be a ___________________________.

8. A conclusion can only be considered ___________________________ when the information came from an unbiased sample.
Determine if the sample method is valid (unbiased) and if so, use the results to make predictions. If the sample is not valid (biased), write not valid on the line and explain why.

1. A representative from the cable company randomly calls 100 households to determine the number of customers who receive movie channels. Of these, 15% do have movie channel access. If there are 2,300 customers total, how many can be expected to have the movie channels?

2. An electronics store just received a huge shipment of video games. Kenny has been put in charge of making sure the goods are not damaged. There are 350 boxes and 50 games in each box. Kenny decides to take the nearest 5 boxes and check for damages. He finds only 2 damaged games, so what can he predict for the total number of damaged games in the boxes?

3. Taylor was given the following problem:

A researcher, who was trying to link after-school students from 20 different schools around the country. He found that 74% of students were involved in after-school sports. How many students surveyed were involved in sports?

This is how Taylor solved the problem:

\[
\begin{array}{ccc}
50 & \times & 20 \\
\times & 74 & \times \\
\hline
1,000 & 74,000 & 1,000 \\
\end{array}
\]

It’s valid because it is a systematic random sample and there were 74,000 students.

Explain what Taylor did wrong.
Use the word problem and table to answer the questions below.

Miguel is the manager of a clothing store. He wants to find out what are the most popular styles of men’s pants and how many of each to order. He decides to survey every 10th man that walks in over a two-week period. Here are his results.

<table>
<thead>
<tr>
<th>Pant Style</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jeans</td>
<td>52</td>
</tr>
<tr>
<td>Khakis</td>
<td>31</td>
</tr>
<tr>
<td>Slacks</td>
<td>17</td>
</tr>
</tbody>
</table>

1. What type of sample does Miguel use for his survey?
2. What percentage of the customers surveyed prefer khakis?
3. What percentage of the customers surveyed prefer jeans?
4. If Miguel has 1,000 male customers over a two week period, how many pairs of jeans will he predict to sell?
5. If he has 1,300 customers in a two week period, how many pairs of slacks will he predict to sell?
6. Why would Miguel’s sample not have been valid if he had decided to survey only the first ten people to walk in?
Using Sampling to Predict

According to the bar graph below, sports video game companies are leading in games sold to children and adults throughout the country. If these companies want to continue to lead in sales they will have to make sure they create games with graphics and features that their customers want. One way to do that is through customer surveys.

In the space below create your own customer survey for a video game. Make sure to ask questions that will give you information to create the best game possible.
Lesson Reading Guide

Misleading Statistics

Get Ready for the Lesson

Read the introduction at the top of page 444 in your textbook. Write your answers below.

1. About how many more passengers per lane can a 40-foot bus transport in an hour than a car can transport?

2. Is the bus on the graph twice as large as the car? Explain.

3. Do you think the graph appeared in a brochure for a train/bus transit company or for a car company? What makes you think so?

Read the Lesson

4. Give an example of a data set you could represent with a graph and how you could represent it in a misleading way.

5. Study Example 1. If you represented a pet supply company, which graph would you use to show that business is booming?

Remember What You Learned

6. Missing labels on graphs and uneven intervals on a scale are two ways a set of statistics can be misleading. Listen for a statistic used on the radio or in a newspaper. Is it a reasonable statement? What other information might you like to have before you consider a statistic to be reasonable?
Graphs can be misleading for many reasons: there is no title, the scale does not include 0; there are no labels on either axis; the intervals on a scale are not equal; or the size of the graphics misrepresents the data.

Example

WEEKLY CHORES The line graphs below show the total hours Salomon spent doing his chores one month. Which graph would be best to use to convince his parents he deserves a raise in his allowance? Explain.

He should use graph A because it makes the total hours seem much larger.

Exercises

PROFITS For Exercises 1 and 2, use the graphs below. It shows a company’s profits over a four-month period.

1. Which graph would be best to use to convince potential investors to invest in this company?

2. Why might the graph be misleading?
1. **INCOME** The bar graphs below show the total U.S. national income (nonfarm). Which graph could be misleading? Explain.

![Graph A](image1)

**Graph A**

**U.S. Nonfarm Income**

- INCOME: Income in Billions of Current Dollars
- YEAR: Year

![Graph B](image2)

**Graph B**

**U.S. Nonfarm Income**

- INCOME: Income in Billions of Current Dollars
- YEAR: Year

**GEOGRAPHY** For Exercises 2–4, use the table that shows the miles of shoreline for five states.

<table>
<thead>
<tr>
<th>State</th>
<th>Length of Shoreline (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virginia</td>
<td>3,315</td>
</tr>
<tr>
<td>Maryland</td>
<td>3,190</td>
</tr>
<tr>
<td>Washington</td>
<td>3,026</td>
</tr>
<tr>
<td>North Carolina</td>
<td>3,375</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>89</td>
</tr>
</tbody>
</table>

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

3. Which measure of central tendency is misleading in describing the miles of shoreline for the states? Explain.

4. Which measure of central tendency most accurately describes the data?
8-9

Practice

Misleading Statistics

ANTIQUES For Exercises 1–3, use the table.

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

2. Which measure might be misleading in describing the value of each item? Explain.

3. Which measure would best describe the value of each item? Explain.

|MOUNTAINS For Exercises 4 and 5, use the graph that shows the elevation of the two highest mountain peaks in Alaska.|

4. Based on the size of the bars compare the elevations of the mountains.

5. Explain how this graph may be misleading.

| 6. BODY TEMPERATURE The graphs below show the hourly body temperature for a hospital patient. Which graph would be more helpful to the doctor in showing the change in body temperature? Explain. |

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desk</td>
<td>$150</td>
</tr>
<tr>
<td>Table</td>
<td>$850</td>
</tr>
<tr>
<td>Painting</td>
<td>$850</td>
</tr>
<tr>
<td>Dishes</td>
<td>$750</td>
</tr>
<tr>
<td>Sewing Machine</td>
<td>$200</td>
</tr>
</tbody>
</table>
8-9
Word Problem Practice
Misleading Statistics

QUIZ SCORES For Exercises 1 and 2, use the data shown in the table below. The table shows the quiz grades for Ms. Andrey’s and Mr. Luna’s classes.

BOOK SALES For Exercises 3 and 4, use the table below. It shows the number of books sold each day for 20 days.

<table>
<thead>
<tr>
<th>Quiz Scores</th>
<th>Book Sales Per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Andrey's Class</td>
<td>Mr. Luna's Class</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>25</td>
<td>29</td>
</tr>
<tr>
<td>12</td>
<td>26</td>
</tr>
<tr>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>23</td>
</tr>
<tr>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>36</td>
<td>24</td>
</tr>
<tr>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>27</td>
<td></td>
</tr>
</tbody>
</table>

1. Ms. Andrey claims the average score on a quiz in her class was 25. Mr. Luna claims the average score on a quiz in his class is 25. Explain how they arrived at these figures.

2. What additional information could be useful in analyzing the data?

3. Find the mean, median, and mode of the data. Which measure of central tendency would be misleading in describing the book sales? Explain.

4. Which value would most accurately describe the data? Explain.
**Misleading Statistics**

We hear numbers and statistics every day. A radio station says, “We’re number 1!” A store advertises, “Lowest prices in town!” The radio station and the store want us to believe their claims. But should we? Sometimes advertisers use statistics that are accurate, but do not tell the whole story. They use *misleading* statistics to help sell their products. What makes the statistics misleading is not what is said, but what is *not* said.

The radio station that says it is “Number 1” may be number 1 in terms of the number of CDs it owns, or the size of its station, or the number of people it employs. But, the station wants people to think it is number 1 in listeners. The statistic is misleading because it does not say what the station is number 1 in.

1. Explain why a store’s advertisement saying it has the “lowest prices in town” may be misleading.

2. Fode has a start-up internet business. One day, he had 1000 hits to his web site. He told advertisers that he had “30,000 hits each month.” Why might this statistic be misleading?

3. Graphs can also be misleading. A consumer group wants to show that the price of gasoline has “skyrocketed” over the past five years. The group made this line graph from the data in the table below.

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per gallon</td>
<td>$1.35</td>
<td>$1.43</td>
<td>$1.56</td>
<td>$1.76</td>
<td>$1.88</td>
<td>$2.20</td>
</tr>
</tbody>
</table>

Why is this graph misleading?

4. Graph the data from Exercise 3 on the grid at the right. How does your graph that starts the y-axis scale at 0 compare to the one above?
The window and zoom functions on a graphing calculator can be used to change the view of a graph. These functions are most often used to help you better see a graph or a portion of a graph. Using these functions can also change the appearance of a graph.

The table at the right shows the mean number of pets for students surveyed.

**Step 1**

Clear all lists by pressing \[2nd\] [MEM] 4 \[ENTER\]. Enter the data. Then follow the instructions to see how the window and zoom features can change the way your graph looks.

**Enter:**

\[2nd\] [STAT PLOT] \[ENTER\] \[ENTER\] \[\downarrow\] \[\rightarrow\] \[ENTER\]

Enter the data from the table under L1 and L2.

\[ZOOM\] 9

The display should show a graph similar to the one at the right. This is the optimal view. It shows all of the graph on the screen as large as possible.

**Step 2**

When you press \[WINDOW\], you will see several options. \(X_{\text{min}}\) is the least value shown on the graph for \(X\), or the age of the students. \(X_{\text{max}}\) is the greatest value shown. Likewise, \(Y_{\text{min}}\) and \(Y_{\text{max}}\) are the least and greatest values of \(Y\), or the mean number of pets. Set the values in the window as shown.

**Step 3**

Press \[GRAPH\]. Notice how the graph has changed. The data did not change at all, only the way they appear on the screen.

Continue to change the values using the window function. Describe how your changes affect the way the graph appears on the screen.
Read each question. Then fill in the correct answer.

1. ○ ○ ○ ○
2. ○ ○ ○ ○
3. ○ ○ ○ ○
4. ○ ○ ○ ○
5. ○ ○ ○ ○
6. ○ ○ ○ ○

7. ○ ○ ○ ○
8. ○ ○ ○ ○
9. ○ ○ ○ ○
10. ○ ○ ○ ○
11. ○ ○ ○ ○
12. ○ ○ ○ ○

Record your answers for Question 13 on the back of this paper.
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 10 Rubric

<table>
<thead>
<tr>
<th>Score</th>
<th>Specific Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>The line graph showing the data is correct and complete including title and labels. The prediction for the year 2006 is about $4,000.</td>
</tr>
<tr>
<td>3</td>
<td>The line graph is correct, but not complete. The prediction is reasonable. <strong>OR</strong> One data point on the graph is incorrectly placed. The prediction is reasonable.</td>
</tr>
<tr>
<td>2</td>
<td>The line graph is correct and complete, but the prediction is not reasonable.</td>
</tr>
<tr>
<td>1</td>
<td>The line graph is poorly drawn with little accuracy and the prediction is not reasonable. <strong>OR</strong> The line graph is incorrect or not given, but the prediction is reasonable.</td>
</tr>
<tr>
<td>0</td>
<td>Response is completely incorrect.</td>
</tr>
</tbody>
</table>
**Chapter 8 Quiz 1**

*(Lessons 8-1, 8-2, and 8-3)*

**SHOPPING** For Questions 1 and 2, use the line plot. It shows the prices for different pairs of sunglasses.

1. What is the range of the data?

2. Find the mean, median, and mode. Which measure best describes the data? Explain.

**SCHOOL** For Questions 3 and 4, use the stem-and-leaf plot. It shows test scores for a group of students.

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

3. How many students took the test?

4. What is the range of the scores?

**EARTHQUAKES** For Questions 1–3, use the table at the right.

<table>
<thead>
<tr>
<th>Magnitude</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.0–7.3</td>
<td>7</td>
</tr>
<tr>
<td>7.4–7.7</td>
<td>5</td>
</tr>
<tr>
<td>7.8–8.1</td>
<td>1</td>
</tr>
<tr>
<td>8.2–8.5</td>
<td>1</td>
</tr>
</tbody>
</table>

1. Describe the data in the table.

2. Draw a histogram to represent the frequency of each interval.

3. Which conclusion *cannot* be made about the data?
   - A. There are 14 earthquakes in the data set.
   - B. The magnitude 7.0 occurred most often.
   - C. The fewest number of earthquakes occurred with a magnitude from 7.8 to 8.5.
   - D. There were 7 earthquakes with magnitude 7.0–7.3.

The bar graph shows the number of phone minutes Nicole used.

4. On which day did she talk the longest?

5. How many minutes did she use in all?

6. On which day did she talk on the phone half as long as she did on Monday?
EXERCISE  The table shows the time it takes Jasmine to bicycle different distances.

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Distance (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>45</td>
<td>10</td>
</tr>
<tr>
<td>67</td>
<td>15</td>
</tr>
<tr>
<td>90</td>
<td>20</td>
</tr>
<tr>
<td>115</td>
<td>25</td>
</tr>
</tbody>
</table>

1. Make a line graph.

2. Predict the total time it will take Jasmine to bicycle 30 miles.

3. RADIO  A survey showed that 22% of adults in Hampshire County listen to the radio while they drive. Suppose there are 41,230 adults that drive in Hampshire County. Predict how many of them listen to the radio while driving.

4. ZOO  A survey of visitors at the zoo showed that 36% chose the polar bear exhibit as their favorite. If 477 people visited the zoo today, predict how many of them would choose the polar bear exhibit as their favorite.

5. PETS  In Rachel's class 41% of the students said they own a dog. If there are 1,072 students in Rachel's school, predict how many of them own a dog.

A random survey of students shows that 20 prefer American cheese, 14 prefer Swiss cheese, and 5 do not like cheese.

1. What is the size of the sample?

2. What percent preferred Swiss cheese?

3. Of 53 students, how many do you think would choose Swiss cheese?

4. TRAVEL  The graph shows the number of pieces of lost luggage for two different airline companies. Why might this graph be misleading?
Chapter 8 Mid-Chapter Test
(Lessons 8-1 and 8-4)

**PART I**

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

1. What is the mode of the data in the stem-and-leaf plot? (Lesson 2-5)
   - A. 232
   - B. 23
   - C. 22
   - D. 4

SCHOOL For Questions 2 and 3, refer to the graph. It shows the results of a survey of students' study period preference during the school day.

2. In which period did the greatest number of students prefer to have a study period?
   - F. 1
   - G. 2
   - H. 3
   - J. 5

3. How many students were surveyed?
   - A. 55
   - B. 105
   - C. 162
   - D. 184

4. What is the mode of the data shown in the line plot?
   - F. 4
   - G. 5-8
   - H. 8
   - J. 10

**PART II**

5. SHOPPING Find the mean, median, and mode for the following set of data.

<table>
<thead>
<tr>
<th>Prices of Rummage Sale Items ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 5 14 1 7</td>
</tr>
<tr>
<td>2 1 3 4 5 6</td>
</tr>
<tr>
<td>8 2 1 1 4 3</td>
</tr>
</tbody>
</table>

ENERGY For Questions 6–8, use the data below. The data show the percents of the total energy produced in the world by each of the top ten energy producers.

2 8 5 3 3 2 19 11 5 3

6. Make a line plot of the data.

7. Identify any clusters, gaps, or outliers.

8. What is the range of data?
Choose from the terms above to complete each sentence.

1. Statistics deals with collecting, organizing, and interpreting __________.

2. A(n) __________ shows trends over time.

3. A(n) __________ displays two sets of data on the same graph.

4. If you want to show the frequency of each number within a data set, you could use a(n) __________.

5. Numbers called ______________ can be used to describe the center of data.

6. The ____________ of a set of data is the number or numbers that occur most often.

7. A(n) __________ uses bars to represent quantities.

8. A(n) __________ uses bars to represent the frequency of data that have been organized in intervals.

Define the following terms in your own words.

9. outlier

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

SURVEYS For Questions 1–4, use the table that shows the survey results in which a sample of shoppers at Carol’s Candles were asked to choose their favorite candle scents. Round to the nearest whole number.

<table>
<thead>
<tr>
<th>Scent</th>
<th>Percent of Shoppers</th>
</tr>
</thead>
<tbody>
<tr>
<td>vanilla</td>
<td>33%</td>
</tr>
<tr>
<td>rose</td>
<td>23%</td>
</tr>
<tr>
<td>pine</td>
<td>15%</td>
</tr>
<tr>
<td>peach</td>
<td>29%</td>
</tr>
</tbody>
</table>

1. Predict how many out of one day’s 128 shoppers prefer pine scented candles.
   A. 10       B. 16       C. 19       D. 21
   1. ___

2. Predict how many out of 972 weekly shoppers prefer vanilla scented candles?
   F. 321      G. 282      H. 253      J. 224
   2. ___

3. Suppose 2,500 people were polled. Predict how many would say peach is their favorite candle scent.
   A. 500      B. 575      C. 650      D. 725
   3. ___

4. What is the probability that a random shopper will buy either a vanilla or peach candle?
   F. 62%      G. 59%      H. 41%      J. 37%
   4. ___

5. WEATHER The graph shows the average monthly temperature in Minneapolis, Minnesota. During which months is the temperature below 40°F?
   A. November–March
   B. March–November
   C. December, January, February
   D. April–October
   5. ___

READING For Questions 6–10, use the line plot.

6. What is the range of data?
   F. 10       H. 5       G. 8       J. 3
   6. ___

7. What is the mode of the data?
   A. 10       B. 9       C. 5       D. 3
   7. ___

8. Which of the following describes a gap in the data?
   F. 2–4      G. 4–7      H. 4–9      J. 1–10
   8. ___

9. Which of the following describes a cluster of data?
   A. 1–4      B. 4–7      C. 4–9      D. 1–10
   9. ___

10. How many students read more than 4 books?
    F. 3        G. 5        H. 8        J. 10
    10. ___

Chapter 8
WEATHER  For Questions 11–13, use the table. It shows the monthly average rainfall in Phoenix, Arizona.

<table>
<thead>
<tr>
<th>Average Rainfall (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 21 30 7 5 3</td>
</tr>
<tr>
<td>21 30 23 14 18 29</td>
</tr>
</tbody>
</table>

11. Find the mean.
   A. 18.5 mm  B. 21 mm  C. 27 mm  D. 222 mm

12. Find the median.
   F. 18 mm  G. 18.5 mm  H. 21 mm  J. 27 mm

13. Find the mode.
   A. 18.5 mm  B. 21 mm  C. 27 mm  D. 30 mm

For Questions 14–16, use the stem-and-leaf plot.

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

14. The stem-and-leaf plot represents which of the following data?
   F. 13 17 10 21 24 32 27 11
   G. 11 21 24 10 27 13 32
   H. 0 1 3 7 1 4 7 2
   J. 17 13 17 32 27 1 24 21

15. What is the range of the data?
   A. 10–32  B. 2  C. 19  D. 22

16. What is the median of the data?
   F. 17  G. 19  H. 21  J. 27

NATURE  For Questions 17–19, use the bar graph. It shows the world’s longest-living mammals.

17. What mammal lives the longest?
   A. gorilla  C. killer whale
   B. human  D. blue whale

18. What is the life span of killer whales?
   F. 80 y  H. 70 y
   G. 90 y  J. 35 y

19. About how much longer is the lifespan of a blue whale than the life span of a gorilla?
   A. 35 y  B. 45 y  C. 80 y  D. 115 y

20. Use the data set $8, $10, $15, $8, $12, $13, $8 and $11. Which measure of central tendency would you use to convince people your prices are low?
   F. none of these  G. mean  H. median  J. mode

Bonus  Describe how bar graphs and histograms are related.

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

**SURVEYS** For Questions 1–4, use the table that shows the results of a survey in which seventh grade students were asked to choose their favorite shade of blue. Round to the nearest whole number.

<table>
<thead>
<tr>
<th>Shade of Blue</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>electric</td>
<td>18%</td>
</tr>
<tr>
<td>sky</td>
<td>29%</td>
</tr>
<tr>
<td>cobalt</td>
<td>12%</td>
</tr>
<tr>
<td>navy</td>
<td>19%</td>
</tr>
<tr>
<td>other</td>
<td>22%</td>
</tr>
</tbody>
</table>

1. Predict how many students in a class of 275 seventh graders prefer cobalt blue.
   - A. 33  
   - B. 50  
   - C. 52  
   - D. 61  

2. Predict about how many out of 518 seventh grade students prefer sky blue.
   - F. 156  
   - G. 150  
   - H. 114  
   - J. 93  

3. Suppose 900 seventh graders were polled. Predict how many would say electric blue is their favorite shade of blue.
   - A. 198  
   - B. 171  
   - C. 162  
   - D. 108  

4. What is the probability that a random seventh grader would prefer either cobalt or navy blue?
   - F. 41%  
   - G. 37%  
   - H. 31%  
   - J. 29%  

**BUSINESS** The line graph shows the number of greeting cards, in thousands, created over several years.

5. About how many more cards, in thousands, were created in 2005 than in 2003?
   - A. 5  
   - B. 8  
   - C. 13  
   - D. 21  

6. If the trend continues, about how many cards will be created in 2009?
   - F. 23,000  
   - G. 18,000  
   - H. 23  
   - J. 18  

**TESTS** For Questions 7–10, refer to the line plot. It shows the quiz scores of students in a biology class.

7. Which of the following describes a cluster of data?
   - A. 9–17  
   - B. 11–13  
   - C. 14–15  
   - D. 18–20  

8. What is the range of the data?
   - F. 12  
   - G. 11  
   - H. 10  
   - J. 3  

9. How many students scored less than 15?
   - A. 1  
   - B. 3  
   - C. 4  
   - D. 5  

10. Determine which sentence is not true.
    - F. 20 occurs most often.  
    - G. There are 17 numbers in the data set.  
    - H. The majority of scores are over 17.  
    - J. There is a gap from 15 to 18.
### SHOPPING
For Questions 11–14, use the table. It shows the prices of guitars on display at a music shop.

<table>
<thead>
<tr>
<th>Guitar Prices ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>350 425 295 1,200 500</td>
</tr>
<tr>
<td>275 2,700 300 425 400</td>
</tr>
<tr>
<td>375 395 275 355 430</td>
</tr>
</tbody>
</table>

11. Find the mean of the data.
   A. $2,700  
   B. $580  
   C. $395  
   D. $275
   11. ____

12. Find the mode of the data.
   F. no mode  
   G. $275, $425  
   H. $275  
   J. $425
   12. ____

13. Find the median of the data.
   A. $395  
   B. $425  
   C. $580  
   D. $2,700
   13. ____

14. Which measure has the least value?
   F. mean  
   G. median  
   H. mode  
   J. range
   14. ____

### HEALTH
For Questions 15–18, use the stem-and-leaf plot. It shows the birth weights of babies born in one week.

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

15. How many babies were born this week at the hospital?
   A. 5  
   B. 16  
   C. 17  
   D. 18
   15. ____

16. What is the range of birth weights?
   F. 3.1 lb  
   G. 6.5 lb  
   H. 8.2 lb  
   J. 31 lb
   16. ____

17. What is the mode of the birth weights?
   A. 60  
   B. 65  
   C. 72  
   D. 78
   17. ____

18. Which measure has the greatest value?
   F. median  
   G. mode  
   H. mean  
   J. range
   18. ____

### SHOPPING
For Questions 19 and 20, refer to the histogram.

19. What is the cost of most cameras?
   A. $400–$499  
   B. $100–$199  
   C. $0–$99  
   D. $11
   19. ____

20. Which is not a true statement?
   F. Four cameras are priced from $300–$399.
   G. The mode of the data is $100–$199.
   H. The most expensive camera is $499.
   J. There are 32 cameras in the data set.
   20. ____

### Bonus SPORTS
The Royals scored 24 total goals with a mean of 4 goals per game. How many games did they play?

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

**SURVEYS** For Questions 1–4, use the table that shows the survey results of 60 people who like popcorn with various toppings. Round to the nearest whole number.

<table>
<thead>
<tr>
<th>Topping</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>butter only</td>
<td>18%</td>
</tr>
<tr>
<td>salt only</td>
<td>30%</td>
</tr>
<tr>
<td>butter and salt</td>
<td>35%</td>
</tr>
<tr>
<td>cheese</td>
<td>7%</td>
</tr>
<tr>
<td>other</td>
<td>10%</td>
</tr>
</tbody>
</table>

1. Predict how many people in a theater of 250 people prefer salt only.
   A. 75       C. 45
   B. 63       D. 25 1. ____

2. Predict how many people in a theater of 365 people prefer butter and salt.
   F. 175      G. 128      H. 110      J. 91 2. ____

3. Suppose 500 people were polled. Predict how many would say cheese was their favorite popcorn topping.
   A. 350      B. 50       C. 35       D. 2 3. ____

4. What is the probability that a random moviegoer would prefer either salt only or cheese?
   F. 40%      G. 37%      H. 35%      J. 28% 4. ____

**MUSIC** The line graph shows the number of band members in a high school for several years.

5. About how many more band members were there in 2003 than in 2005?
   A. 20       B. 30       C. 35       D. 70 5. ____

6. If the trend continues, about how many students will be band members in 2009?
   F. 15       H. 59
   G. 45       J. 100 6. ____

**WEATHER** For Questions 7–10, refer to the line plot. It shows the high temperature for each day in a city.

7. Which of the following describes a cluster of data?
   A. 86–90     B. 84–88     C. 79–84     D. 72–78 7. ____

8. What is the range of the data?
   F. 17       G. 20       H. 21       J. 22 8. ____

9. For how many days was the high temperature greater than 82?
   A. 4       B. 5       C. 8       D. 9 9. ____

10. Determine which sentence is not true.
    F. The majority of temperatures are over 80.  H. 82 occurs most often.
    G. There are no gaps or outliers.  J. 19 numbers are in the data set. 10. ____
WEATHER For Questions 11–14, use the table.

### Annual Rainfall (in.)

<table>
<thead>
<tr>
<th></th>
<th>36</th>
<th>28</th>
<th>38</th>
<th>28</th>
<th>30</th>
<th>20</th>
<th>35</th>
<th>94</th>
<th>37</th>
<th>29</th>
</tr>
</thead>
</table>

11. Find the mean of the data.
   A. 94 in.      C. 32.5 in.
   B. 37.5 in.    D. 28 in.

12. Find the mode of the data.
   F. no mode     G. 28 in.     H. 32.5 in.    J. 94 in.

13. Find the median of the data.
   A. 28 in.      B. 30 in.    C. 32.5 in.    D. 37.5 in.

14. Which measure has the least value?
   F. mean        G. median    H. mode      J. range

STOCK MARKET For Questions 15–18, use the stem-and-leaf plot. It shows the closing price of a stock on the stock market each day.

### Stem-and-Leaf Plot

<table>
<thead>
<tr>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

15. How many days of closing prices are represented on the stem-and-leaf plot?
   A. 14    B. 13    C. 12    D. 4

16. What is the range of closing prices?
   F. $3      G. $26     H. $27     J. $43

17. What is the mode of the closing prices?
   A. 26      B. 39      C. 40      D. 43

18. What is the median of the closing prices?
   F. $39     G. $40     H. $43     J. $51

TECHNOLOGY For Questions 19 and 20, refer to the histogram.

### Calculators Histogram

<table>
<thead>
<tr>
<th>Price ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–19</td>
</tr>
<tr>
<td>20–59</td>
</tr>
<tr>
<td>60–79</td>
</tr>
<tr>
<td>80–99</td>
</tr>
<tr>
<td>100–119</td>
</tr>
</tbody>
</table>

19. Which price range has the least frequency?
   A. $80–99    B. $20–39    C. $0–19    D. $2

20. Which is not a true statement?
   F. The mode of the data is 11.
   G. Eight calculators are priced from $40–$59.
   H. There are 42 calculators in the data set.
   J. Most calculators are priced from $20–$39.

Bonus SPORTS The Bobcats had a mean of 54 points per game and a total of 432 points. How many games did they play?
VOTERS Of 650,000 registered voters, 1038 were surveyed. Their voting preferences are listed in the table. Use the table for Questions 1 and 2.

<table>
<thead>
<tr>
<th>Candidate</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calligan</td>
<td>30%</td>
</tr>
<tr>
<td>Juniper</td>
<td>20%</td>
</tr>
<tr>
<td>Anderson</td>
<td>28%</td>
</tr>
<tr>
<td>Undecided</td>
<td>22%</td>
</tr>
</tbody>
</table>

1. Predict how many of the registered voters would vote for Juniper.

2. Predict how many of the registered voters are undecided.

3. MARKETING The line graph shows the sales, in hundreds of dollars, of books from a business for the past several years. If the trend continues, about what will the sales be in 2009?

4. Find the mean, median, and mode for the following data. Round to the nearest tenth if necessary.
   2.3, 2.4, 2.1, 2.4, 2.7, 2.3, 2.5, 2.4

5. Make a bar graph of the data.

6. What do the horizontal and vertical axes represent?

GEOGRAPHY For Questions 5 and 6, use the following information.

These are the lengths of four rivers in Texas: Brazos (950 miles), Pecos (926 miles), Trinity (360 miles), and Washita (500 miles).

5. What do the horizontal and vertical axes represent?

6. ____________________

SHOPPING For Questions 7–10, use the stem-and-leaf plot.

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

7. How many different pairs of sandals does the store carry?

8. What is the range of the prices of sandals?

9. Find the median and mode for the data.

10. Write a sentence or two to describe how the prices of sandals are spread out.
For Questions 11 and 12, use the table. It shows the number of books borrowed from a library.

### Number of Books

<table>
<thead>
<tr>
<th>Number of Books</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 3 15 24 24 37 55 39 40 35 28 20 0</td>
</tr>
</tbody>
</table>

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


### TECHNOLOGY For Questions 13–15, use the table. It shows the number of CDs owned by students in a class.

### Number of CDs

<table>
<thead>
<tr>
<th>Number of CDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 6 13 12 0 15 12 0 15 11 10 14 9 15 22</td>
</tr>
</tbody>
</table>

13. Make a line plot of the data.

14. Identify any clusters, gaps, or outliers.

15. Summarize the data in a sentence or two.

16. MOVIES A survey showed that 8 out of 12 teens prefer going to a movie theater rather than watching a movie at home. Based on this survey, how many teenagers in a class of 60 prefer going to the theater?

17. FUNDRAISER To determine which students will attend the school fundraiser, 30 students are picked at random from each grade level. Is this conclusion valid? Justify your answer.

18. FROZEN YOGURT To determine which flavor of frozen yogurt is preferred by most customers, the manager of a frozen yogurt store surveys every 20th customer that enters the store. Is this conclusion valid? Justify your answer.

19. BUSINESS The line graphs show the profits of a company from January to May. Which graph could be misleading? Why?

### Graph A

#### Company Profits

<table>
<thead>
<tr>
<th>Profit ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,200</td>
</tr>
<tr>
<td>11,400</td>
</tr>
<tr>
<td>11,500</td>
</tr>
<tr>
<td>11,600</td>
</tr>
<tr>
<td>11,700</td>
</tr>
<tr>
<td>11,800</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>M</td>
</tr>
</tbody>
</table>

### Graph B

#### Company Profits

<table>
<thead>
<tr>
<th>Profit ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,200</td>
</tr>
<tr>
<td>11,400</td>
</tr>
<tr>
<td>11,600</td>
</tr>
<tr>
<td>11,800</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>M</td>
</tr>
</tbody>
</table>

### Bonus

Without calculating, would the mean, median, or mode be most affected by eliminating 12 from the list below? Which would be the least affected? Explain.

139, 140, 175, 12, 99, 150, 140

B: ____________________________
VOTERS Of 350,000 registered voters, 800 were surveyed. Their voting preferences are listed in the table. Use the table for Questions 1 and 2.

1. Predict how many of the registered voters would vote for Ledo.
2. Predict how many of the registered voters would vote for Sanchez.

<table>
<thead>
<tr>
<th>Candidate</th>
<th>Percent of Voters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carroll</td>
<td>19%</td>
</tr>
<tr>
<td>Ledo</td>
<td>34%</td>
</tr>
<tr>
<td>Sanchez</td>
<td>27%</td>
</tr>
<tr>
<td>Undecided</td>
<td>20%</td>
</tr>
</tbody>
</table>

3. AGRICULTURE The line graph shows the bushels of soybeans, in hundreds, harvested by an Illinois farmer for several years. If the trend continues, about how many bushels will be harvested in 2008?

4. Find the mean, median, and mode for the following data. Round to the nearest tenth if necessary.
   8.2, 8.7, 8.1, 8.5, 8.1, 8.6, 8.2, 8.1

5. BUDGET For Questions 5 and 6, use the following information.
The Hamil family’s monthly budget is rent ($900), food ($350), utilities ($75), entertainment ($140), and other ($280).

5. Make a bar graph of the data.

6. What do the horizontal and vertical axes represent?

SCHOOL For Questions 7–10, use the stem-and-leaf plot. It shows the number of hours students spend studying per day.

7. How many students are represented on the stem-and-leaf plot?

8. What is the range of hours studying?

9. Find the median and mode for the data.

10. Write a sentence or two to describe how the hours spent studying are spread out.
CLUBS  For Questions 11 and 12, use the table. It shows the number of students in each extracurricular school club.

<table>
<thead>
<tr>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 12 15 73</td>
</tr>
<tr>
<td>13 20 12 16</td>
</tr>
<tr>
<td>15 25 9</td>
</tr>
</tbody>
</table>

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


MOVIES  For Questions 13–15, use the table. It shows the number of movies students attended in a theater during the last month.

<table>
<thead>
<tr>
<th>Movies</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 4 0 1 3</td>
</tr>
<tr>
<td>3 0 1 3 2 9</td>
</tr>
<tr>
<td>11 3 2 5 4 0</td>
</tr>
</tbody>
</table>

13. Make a line plot of the data.

14. Identify any clusters, gaps, or outliers.

15. Summarize the data in a sentence or two.

16. HEALTH  A survey showed that 4 out of 10 teens drink at least 6 glasses of water each day. Based on that survey, how many teenagers in a class of 40 do you expect to drink at least six glasses of water each day?

17. MUSIC  To evaluate the quality of digital music players, the manufacturer pulls every 30th digital music player off the assembly line to check for defects. Is this conclusion valid? Justify your answer.

18. SHOPPING  To evaluate their service, a department store asks its customers to call a number and complete a telephone survey. The majority of those who replied said that they prefer the store stay open one extra hour. As a result, the store decides to stay open one extra hour each night. Is this conclusion valid? Justify your answer.

19. BUSINESS  The line graphs show the profits of a company from June to October. Which graph could be misleading? Why?

![Graph A](image1)

![Graph B](image2)

B: ________________

Bonus  Without calculating, would the mean, median, or mode be most affected by eliminating 340 from the list below? Which would be the least affected? Explain.

38, 47, 340, 52, 35, 34
MUSIC  For Questions 1–3, use the table. It shows the length (in seconds) of a hit single on students’ favorite music CDs.

1. Make a histogram to represent the data.

2. In which interval does the length of most of the hit singles fall?

3. If a student listens to his or her favorite hit single two times, what is the longest and shortest amount of listening time?

<table>
<thead>
<tr>
<th>Length of Hit Single (s)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>220 150 220 205 256</td>
<td></td>
</tr>
<tr>
<td>178 261 258 327 275</td>
<td></td>
</tr>
<tr>
<td>166 341 157 208 219</td>
<td></td>
</tr>
<tr>
<td>184 265 225 329 248</td>
<td></td>
</tr>
</tbody>
</table>

MILK  For Questions 4 and 5, use the table. It shows the prices of a half gallon of milk from 1910 to 1970.

4. Make a line graph of the data.

5. Predict the price of a half gallon of milk in 2010.

<table>
<thead>
<tr>
<th>Year</th>
<th>Price (¢)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1910</td>
<td>17</td>
</tr>
<tr>
<td>1920</td>
<td>33</td>
</tr>
<tr>
<td>1930</td>
<td>28</td>
</tr>
<tr>
<td>1940</td>
<td>26</td>
</tr>
<tr>
<td>1950</td>
<td>41</td>
</tr>
<tr>
<td>1960</td>
<td>52</td>
</tr>
<tr>
<td>1970</td>
<td>66</td>
</tr>
</tbody>
</table>

NATURAL DISASTER  For Questions 6–9, use the table. It shows the magnitudes of the largest earthquakes recorded from 1988–2002.

6. Make a line plot of the data.

7. What is the range?

8. What is the mode?

9. Identify any clusters, gaps, or outliers.

<table>
<thead>
<tr>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0 6.1 6.3 7.7 7.1 7.0</td>
</tr>
<tr>
<td>6.9 6.1 7.9 7.6 7.4</td>
</tr>
</tbody>
</table>

10. NATURE  Why might this graph be misleading?

<table>
<thead>
<tr>
<th>Lizards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
</tr>
<tr>
<td>Komodo Dragon</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>
For Questions 11 and 12, use the table. It shows the population of the five largest cities in the world.

<table>
<thead>
<tr>
<th>City</th>
<th>Population (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tokyo, Japan</td>
<td>26,444</td>
</tr>
<tr>
<td>Mexico City, Mexico</td>
<td>18,131</td>
</tr>
<tr>
<td>Mumbai, India</td>
<td>18,066</td>
</tr>
<tr>
<td>São Paulo, Brazil</td>
<td>17,755</td>
</tr>
<tr>
<td>New York City, U.S.</td>
<td>16,640</td>
</tr>
</tbody>
</table>

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

12. Would the mean or median be most affected by eliminating Tokyo’s population from the list? Explain.

For Questions 13 and 14, use the table. It shows the number of actors who starred in different movies.

<table>
<thead>
<tr>
<th>Number of Actors</th>
</tr>
</thead>
<tbody>
<tr>
<td>44 10 24 5 29 30</td>
</tr>
<tr>
<td>28 29 18 50 23 3</td>
</tr>
<tr>
<td>24 26 8 34 20 24</td>
</tr>
<tr>
<td>24 25 9 15 39 16</td>
</tr>
</tbody>
</table>

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

14. Find the median and mode for the data.

For Questions 15 and 16, use the table. Their voting preferences are listed in the table.

<table>
<thead>
<tr>
<th>Candidate</th>
<th>Percent of Voters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mulroney</td>
<td>33%</td>
</tr>
<tr>
<td>Alvarez</td>
<td>21%</td>
</tr>
<tr>
<td>Jones</td>
<td>23%</td>
</tr>
<tr>
<td>Undecided</td>
<td>23%</td>
</tr>
</tbody>
</table>

15. Predict how many of the registered voters would vote for Jones.

16. Predict how many of the registered voters would vote for Alvarez.

Bonus Do values that are much greater or much less than the other values affect the mean of a set of data? Give an example to support your answer.

B: _______________
1. The graph below gives the mean of the total scores of two teams for all of their football games in each year in a recent decade.

![Graph of Scoring in College Football]

a. What was the mean total score per college football game in Year 5?

b. What would you expect the mean total score to be in Year 11? Explain your answer.

c. Explain why the graph might be considered misleading.

2. The number of home runs hit by Babe Ruth each year from 1918 through 1931 were 11, 29, 54, 59, 35, 41, 46, 33, 47, 60, 54, 46, 49, and 46.

a. Make a line plot for the set of data. Explain what is meant by a cluster. Circle any clusters on the line plot.

b. Explain in your own words what is meant by the mean, median, and mode of a set of data. Find the mean, median, and mode of the set of data. If necessary, round to the nearest tenth. Show your work.

c. Make a stem-and-leaf plot of the number of home runs Babe Ruth hit each year. Explain each step.

3. Explain what it means to analyze data. Describe some methods for analyzing data.
1. Solve $y - 12 = 73$. (Lesson 1-7)
   A 61   B 62   C 85   D 86

2. Evaluate $j + k$ if $j = 14$ and $k = -9$. (Lesson 2-4)
   F -23   G -5   H 5   J 23

3. **MUSIC** Refer to the table. It shows the results of a survey in which 287 middle school students were asked to name their favorite types of music. How many students would you expect to choose country as their favorite type of music. (Lesson 8-8)
<table>
<thead>
<tr>
<th>Type of Music</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>rock 'n' roll</td>
<td>35%</td>
</tr>
<tr>
<td>classical/jazz</td>
<td>10%</td>
</tr>
<tr>
<td>country</td>
<td>26%</td>
</tr>
<tr>
<td>pop</td>
<td>29%</td>
</tr>
</tbody>
</table>
   A 9   B 19   C 90   D 190

4. Find the LCM of 21 and 49. (Lesson 4-8)
   F 3   G 7   H 14   J 147

5. Find $\frac{2}{5} + \frac{4}{5}$. Write in simplest form. (Lesson 5-2)
   A $1\frac{1}{5}$   B $3\frac{3}{5}$   C $2\frac{2}{5}$   D $\frac{6}{25}$

6. Solve $10 = \frac{4}{5}w$. (Lesson 5-7)
   F $12\frac{1}{2}$   G $8\frac{1}{2}$   H 8   J 5

7. Write 3.95 as a percent. (Lesson 6-9)
   A 0.0395%   B 3.95%   C $3\frac{19}{20}$%   D 395%

8. Find the percent of discount to the nearest percent if the regular price is $38 and the sale price is $19.60. (Lesson 7-7)
   F 3%   G 7%   H 48%   J 70%

9. Find the interest earned to the nearest cent for a principal of $250, an interest rate of 11.25%, and a time period of 4 months. (Lesson 7-8)
   A $112.50   B $88.69   C $9.38   D $7.40

10. **ENVIRONMENT** The bar graph represents the content (in percents) of U.S. landfills. Which is not a true statement? (Lesson 8-4)
   F The mode is paper.
   G Metal makes up 8% of landfills.
   H Plastic and paper make up most of landfills.
   J The median is 16%.
POPULATION For Questions 11 and 12, refer to the line plot given. It shows the population (in millions) of the largest cities in the world.

11. Which of the following describes a cluster of data? (Lesson 8-1)
   A 12–13   C 18–26
   B 13   D 26  11. ☐ ☐ ☐ ☐

12. Determine which sentence is not true? (Lesson 8-2)
   F The mode is 4.
   G The majority of the data is below 18.
   H The range is 14.
   J There are 10 numbers in the data set. 12. ☐ ☐ ☐ ☐

CALCULATORS For Questions 13 and 14, refer to the histogram given. It shows the cost of calculators at an electronics store. (Lesson 8-4)

13. What is the interval?
   A 11   C 19
   B $0–$119   D 20  13. ☐ ☐ ☐ ☐

14. What is the cost of the greatest number of calculators?
   F $0–$19   H $20–$39

15. Solve $1.7t = 8.5$. (Lesson 3-3)
   A 5   C 10.2
   B 6.8   D 14.45  15. ☐ ☐ ☐ ☐

16. What is 25% of $250$? (Lesson 7-1)
   F 1000   H 10
   G 62.5   J 6.25  16. ☐ ☐ ☐ ☐
17. Write $\frac{15}{37}$ as a decimal using bar notation. (Lesson 4-5)

18. ASTRONOMY The stem-and-leaf plot shows the mean distance (millions of miles) that the first ten asteroids are from the Sun. Find the median for these data. (Lessons 8-2, 8-3)

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>21</td>
<td>9</td>
</tr>
<tr>
<td>22</td>
<td>1  1  2  5</td>
</tr>
<tr>
<td>23</td>
<td>9</td>
</tr>
<tr>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>25</td>
<td>7  7</td>
</tr>
</tbody>
</table>

19. MARRIAGE The line graph shows the median age for a female’s first marriage. Predict the age for a female’s first marriage in 2010. (Lesson 8-6)

20. WEATHER Refer to the data which gives the average monthly rainfall in Phoenix, Arizona.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfall (mm)</td>
<td>21</td>
<td>21</td>
<td>30</td>
<td>7</td>
<td>5</td>
<td>21</td>
<td>30</td>
<td>23</td>
<td>14</td>
<td>18</td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

a. Explain how to find the range of the data and give the range. (Lesson 2-3)

b. Find the median of the data. Show your work. (Lesson 2-4)
Get Ready for the Lesson

Read the introduction at the top of page 396 in your textbook. Write your answers below.

1. Do any of the values seem much greater or much less than the other data values?
   Yes; 73 and 62 seem much greater than the other data values.

2. Do some of the buildings have the same number of stories? Is this easy to see? Explain.
   More than one building has 52 stories, 44 stories, 42 stories, and 39 stories. Without listing
   the data in order, this is not easy to determine.

Read the Lesson

3. If the least number of a data set is 75 and the greatest number in the set is 200, what is the
   range?
   125

4. Give an example of a set of data for which you could create a line plot.
   Sample answer: the number of students who earned each grade on a test.

5. If you see a gap in a line plot, what do you know about that interval?
   Sample answer: There are no data in that interval.

Remember What You Learned

6. Discuss what pieces of information a line plot can provide for a set of data.
   Sample answers: range of data, location of data, gaps in data, frequency of data, outliers.

Anticipation Guide (Analyzing Data)

Before you begin Chapter 8

• Read each statement.
• Decide whether you Agree (A) or Disagree (D) with the statement.
• Write A or D in the first column OR if you are not sure whether you agree or disagree, write NS (Not Sure).

After you complete Chapter 8

• Reread each statement and complete the last column by entering an A or a D.
• Did any of your opinions about the statements change from the first column?
• For those statements that you mark with a D, use a piece of paper to write an example of why you disagree.

<table>
<thead>
<tr>
<th>STEP 1</th>
<th>A, D, or NS</th>
<th>STEP 2</th>
<th>A or D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When drawing a number line for a line plot you must always start the number line at 0.</td>
<td>D</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>2. A stem-and-leaf plot of the data 12, 15, 22, 10, 26, 37, 14, and 36 would be formed by the digits 0, 2, 4, 5, 6, and 7.</td>
<td>D</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>3. The mode of a set of data is the middle number of the ordered data.</td>
<td>D</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>4. The bar of a bar graph must have equal width but the bars of a histogram can have different widths.</td>
<td>A</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>5. Since all graphs are useful to help draw conclusions about a set of data, any graph may be chosen to represent that set.</td>
<td>D</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>6. The same conclusions can be drawn from a chart or a graph as from a line plot.</td>
<td>D</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>7. Line plots are a better way to predict future events than scatter plots.</td>
<td>D</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>8. A circle graph is better to use than a line plot.</td>
<td>A</td>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>

Sample answer: There are no data in that interval.
Study Guide and Intervention

Line Plots

Example 1

SHOE SIZE The table shows the shoe size of students in Mr. Kowa’s classroom. Make a line plot of the data.

<table>
<thead>
<tr>
<th>Shoe Sizes</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

Step 1 Draw a number line. Because the smallest size is 4 and the largest size is 14, you can use a scale of 4 to 14 and an interval of 2.

Step 2 Put an “x” above the number that represents the shoe size of each student.

Example 2

Use the line plot in Example 1. Identify any clusters, gaps, or outliers and analyze the data by using these values. What is the range of data?

Many of the data cluster around 6 and 10. You could say that most of the shoe sizes are 6 or 10. There is a gap between 11 and 14, so there are no shoe sizes in this range. The number 14 appears removed from the rest of the data, so it would be considered an outlier. This means that the shoe size of 14 is very large and is not representative of the whole data set.

The greatest shoe size is 14, and the smallest is 4. The range is 14 – 4 or 10.

Exercises

1. For Exercises 1–3, use the table at the right that shows the number of fish each person caught on a fishing trip. Make a line plot of the data.

<table>
<thead>
<tr>
<th>Number of Fish</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

What is the range of the data? 8

2. Identify any clusters, gaps, or outliers. Sample answer: There is a cluster around 1 and 2. There is a gap between 4 and 8. 8 is an outlier.

3. What is the range of the data? 8
1. Make a line plot for the data.

2. How many televisions do most families own? 2 televisions

3. What is the greatest number of televisions owned by a family? 5 televisions

4. What is the range of the data? The range would be 4 instead of 5.
Enrichment

Enhanced Line Plots

You have learned to create line plots to analyze given data. Sometimes altering a line plot can show even more information about a data set.

**SPORTS** For Exercises 1–4, use the following data about the Super Bowl.

The National Football League began choosing its champion in the Super Bowl in 1967. The list below shows the margin of victory and the winning league for the first 40 Super Bowl games. In the list, A indicates that the winning team is from the American Football Conference (AFC), N indicates that the winning team is from the National Football Conference.

<table>
<thead>
<tr>
<th>Year</th>
<th>Margin</th>
<th>Year</th>
<th>Margin</th>
<th>Year</th>
<th>Margin</th>
<th>Year</th>
<th>Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25-N</td>
<td>11</td>
<td>19-N</td>
<td>21</td>
<td>19-N</td>
<td>31</td>
<td>14-A</td>
</tr>
<tr>
<td>2</td>
<td>19-N</td>
<td>12</td>
<td>17-N</td>
<td>22</td>
<td>32-N</td>
<td>32</td>
<td>7-A</td>
</tr>
<tr>
<td>3</td>
<td>9-A</td>
<td>13</td>
<td>4-A</td>
<td>23</td>
<td>4-N</td>
<td>33</td>
<td>15-A</td>
</tr>
<tr>
<td>4</td>
<td>16-A</td>
<td>14</td>
<td>12-A</td>
<td>24</td>
<td>45-N</td>
<td>34</td>
<td>7-N</td>
</tr>
<tr>
<td>5</td>
<td>3-A</td>
<td>15</td>
<td>17-A</td>
<td>25</td>
<td>1-N</td>
<td>35</td>
<td>27-N</td>
</tr>
<tr>
<td>6</td>
<td>21-N</td>
<td>16</td>
<td>5-N</td>
<td>26</td>
<td>13-N</td>
<td>36</td>
<td>3-A</td>
</tr>
<tr>
<td>7</td>
<td>7-A</td>
<td>17</td>
<td>10-N</td>
<td>27</td>
<td>35-N</td>
<td>37</td>
<td>27-N</td>
</tr>
<tr>
<td>8</td>
<td>17-A</td>
<td>18</td>
<td>29-N</td>
<td>28</td>
<td>17-N</td>
<td>38</td>
<td>3-A</td>
</tr>
<tr>
<td>9</td>
<td>10-A</td>
<td>19</td>
<td>22-N</td>
<td>29</td>
<td>23-N</td>
<td>39</td>
<td>3-A</td>
</tr>
<tr>
<td>10</td>
<td>4-A</td>
<td>20</td>
<td>36-N</td>
<td>30</td>
<td>10-N</td>
<td>40</td>
<td>11-A</td>
</tr>
</tbody>
</table>

1. Make a line plot of the numerical data.

2. What do you observe about the winning margins? **Sample answer:** The majority of the margins were less than 20 points, with the highest concentration of margins from 3 to 17 points.

3. Make a new line plot for the winning margins by replacing each × with A for an AFC win or N for an NFC win. What do you observe about the winning margins when looking at this enhanced line plot? **Sample answer:** The margins tend to be higher for games that are won by NFC teams.

4. The list of Super Bowl margins is given in order of years: first 25-N, then 9-N, and so on. Describe any patterns you see in the margins or in the winning league over the years of the Super Bowl. **Sample answer:** The AFC won most of the early Super Bowls, then the NFC won a string of 13 Super Bowls in a row. The AFC has won most of the Super Bowls since that string ended.

### Spreadsheet Activity

**Line Plots**

You can use a spreadsheet to create line plots.

**Example**

Hellen teaches a math class at State University. She wants to look at the relationship between the number of days a student misses class out of 20 classes and the average grades. Create a line plot from the data to the right.

**Step 1**
Enter the days missed in the first column and the average grade in the second column. Press **ENTER** after each day to move to the cell below.

**Step 2**
Choose the chart wizard from the toolbar. Next, select **XY (Scatter)** and choose scatter with data points connected by lines. Press **NEXT**, **NEXT**, **NEXT**, and **FINISH**. This will give a line plot of the data.

*Note: If the data is not in descending order, first sort the data so that it is.*

**Answer the following questions.**

1. **Does there appear to be a relationship between the number of classes missed and the average grades?**
   - Yes, the less a student goes to class the lower the grade average.

2. **What advice would you give to a student in one of Hellen’s classes?**
   - Go to class everyday.

3. **Research the population of your state for 10 years and using a spreadsheet create a line plot with the data.**
   - See students’ work.
Lesson Reading Guide

Measures of Central Tendency and Range

Get Ready for the Lesson
Complete the Mini Lab at the top of page 402 in your textbook. Write your answers below.

1. What was the average score for the five quizzes? 
   
2. If the quiz score of 14 points is added to the data, how many pennies would be in each cup? 

Read the Lesson
3. Look at the data set 2, 5, 5, 6, 8, 11, 12. What is the mean? the median? the mode? 

4. Match the measure of central tendency with the description of when it would be most useful.

   - median ______ b. The data set has many identical numbers.
   - mean ______ c. There are no big gaps in the middle of the data.
   - mode ______ a. The data set has no outliers.

5. If you wanted to find the average height of all of the students in a classroom, which would be the most accurate to use—mean, median, or mode? Why?

Remember What You Learned
6. In baseball, a player has a batting average. What does this average measure? What kind of data would you need to calculate a batting average? Sample answer: A batting average indicates how successful a player was at hitting given a number of opportunities (called “at bats”). To calculate a batting average, you would need at least a number of hits and a number of at bats.
Find the mean, median, and mode for each set of data. Round to the nearest tenth if necessary.

1. Number of parking spaces used: 45, 39, 41, 45, 44, 64, 51
   mean: 47 spaces; median: 45 spaces; mode: 45 spaces

2. Prices of plants: $10, $8, $20, $25, $14, $39, $10, $10, $8, $16
   mean: $16; median: $12; mode: $10

3. Points scored during football season: 14, 20, 3, 9, 18, 35, 21, 24, 31, 12, 7
   mean: 17.6 points; median: 18 points; mode: none

4. Golf scores: 3, 6, 11, 2, 12, 1, 3, 6, 11, 2
   mean: 4; median: 4; mode: 1 and 2

5. Percent increase: 3.3, 4.1, 3.9, 5.0, 3.5, 2.9, 3.9
   mean: 3.8; median: 3.9; mode: 3.9

6. Dollars Spent Shopping:
   mean: $40; median: $39; mode: $38

7. Children living at home in a neighborhood of 24 homes. Which measure best describes the data: mean, median, or mode? Explain. Sample answer: The data would best be described by any one of the three measures: mean, 2.2; median, 2; or mode, 2.

8. The table shows the hours Sam worked each week during the summer. How many hours did he work during the twelfth week to average 20 hours per week?

<table>
<thead>
<tr>
<th>Hours Worked</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 24 20 19 15 21</td>
</tr>
<tr>
<td>20 19 18 22 22 7</td>
</tr>
<tr>
<td>22 hours</td>
</tr>
</tbody>
</table>
Quartiles
The median is a number that describes the “center” of a set of data. Here are two sets with the same median, 50, indicated by .
But, sometimes a single number may not be enough. The numbers shown in the triangles can also be used to describe the data. They are called quartiles. The lower quartile is the median of the lower half of the data. It is indicated by . The upper quartile is the median of the upper half. It is indicated by .

Circle the median in each set of data. Draw triangles around the quartiles.

1. 2
2. 3
3. 4

Use the following set of test scores to solve the problems.
71 57 29 37 53 41 25 37 53 27
62 55 75 48 66 53 66 48 75 66

5. Which scores are “in the lower quartile”?
25, 27, 29, and 37

6. How high would you have to score to be “in the upper quartile”?
66 or higher
Lesson Reading Guide

Stem-and-Leaf Plots

Get Ready for the Lesson
Read the introduction at the top of page 410 in your textbook. Write your answers below:

1. Which chick weight is the lightest? 5 grams

2. How many of the weights are less than 10 grams? 3

Read the Lesson
3. What can you determine easily from a stem-and-leaf plot? The greatest value, least value, mode, and median

4. How do you determine the stems of a stem-and-leaf plot? How do you determine the leaves? The stems are the digits of the greatest place value of the data; the leaves are the digits in the least place value.

5. If you look at a stem-and-leaf plot, how can you tell what the stems and leaves represent? Sample answer: Use the key that shows how the digits are related.

Remember What You Learned
6. Describe how the arrangement of stems and leaves in a stem-and-leaf plot relates to a plant or tree. Sample answer: In a stem-and-leaf plot, the leaves in one row all share a common stem, just like a group of leaves attached to a common stem (or branch) of a tree. Every leaf belongs to a particular stem.
In a stem-and-leaf plot, the data are organized from least to greatest. The digits of the least place value usually form the leaves, and the next place value digits form the stems.

Make a stem-and-leaf plot of the data below. Then find the range, median, and mode of the data.

42, 45, 37, 46, 45, 46, 47, 49, 63, 45

Order the data from least to greatest.

35, 35, 37, 42, 45, 45, 46, 47, 49, 63

The least value is 35, and the greatest value is 63.
The range is greater value – least value = 63 – 35 = 28
The median is the middle value.
The mode is the most frequent value.

Make a stem-and-leaf plot for each set of data. Then find the range, median, and mode of the data.

1. 15, 25, 16, 28, 1, 27, 16, 19, 28
2. 1, 2, 3, 2, 3, 4, 2, 5, 7, 10

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

1. 35, 35, 37, 42, 45, 45, 46, 47, 49, 63
2. 3, 4, 6, 17, 12, 5, 17, 4, 26, 17, 18, 21, 16, 15, 20
3. 26, 27, 23, 24, 26, 31, 45, 33, 32, 41
4. 347, 334, 346, 330, 348, 347, 359, 344, 357

HOT DOGS For Exercises 5–7, use the stem-and-leaf plot at the right that shows the number of hot dogs eaten during a contest.

5. How many hot dogs are represented on the stem-and-leaf plot?
6. What is the range of the number of hot dogs eaten?
7. Find the median and mode of the data.

Determine the mean, median, and mode of the data shown in each stem-and-leaf plot.

8. 13; 15; 20
9. 20; 2; 4
10. 22; 23; 24; 24
11. 0; 12; 12; 20

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For Exercises 1–6, use the table below. It shows the number of endangered species in the U.S.

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>mammals</td>
<td>60</td>
</tr>
<tr>
<td>bats</td>
<td>78</td>
</tr>
<tr>
<td>birds</td>
<td>14</td>
</tr>
<tr>
<td>amphibians</td>
<td>10</td>
</tr>
<tr>
<td>fishes</td>
<td>70</td>
</tr>
<tr>
<td>clams</td>
<td>56</td>
</tr>
<tr>
<td>insects</td>
<td>20</td>
</tr>
<tr>
<td>arachnids</td>
<td>12</td>
</tr>
<tr>
<td>crustaceans</td>
<td>15</td>
</tr>
<tr>
<td>crustaceans</td>
<td>15</td>
</tr>
</tbody>
</table>

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

2. What group has the greatest number of endangered species in the U.S.?
   - birds

3. What group has the least number of endangered species in the U.S.?
   - amphibians

4. What is the range of the data?
   - 68

5. Use your stem-and-leaf plot to determine the median and mode.
   - median: 25; mode: none

6. How many groups have less than 30 endangered species in the U.S.?
   - 5

GOLD MEDALS
For Exercises 3–5, use the stem-and-leaf plot that shows the number of gold medals won by each of the top 15 countries at the 2004 Summer Olympics.

3. Find the range of gold medals won.
   - 81

4. Find the median and the mode of the data.
   - median: 10; mode: 9

5. Based on the data, write one inference that can be made about the data.
   - Sample answer: A gap occurs between 17 and 27 gold medals.

6. How many presidents have less than 30 years of age at inauguration?
   - 2 presidents

7. Find the ages of the youngest and oldest president at inauguration.
   - youngest: 42 years; oldest: 69 years

8. Find the ages of the youngest and oldest president at inauguration.
   - youngest: 42 years; oldest: 69 years

9. Find the ages of the youngest and oldest president at inauguration.
   - youngest: 42 years; oldest: 69 years

10. Find the ages of the youngest and oldest president at inauguration.
    - youngest: 42 years; oldest: 69 years

Source: factmonster.com

Weight of Male Lions (pounds)

<table>
<thead>
<tr>
<th>Stem Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
<tr>
<td>25 55 64 33 67 44 54 46 0 2 5 6</td>
</tr>
<tr>
<td>445 436 440 475 426 444 455 485 437 450 466 470</td>
</tr>
</tbody>
</table>

29 gold medals
Source: athens2004.com

Test Scores

<table>
<thead>
<tr>
<th>Stem Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 88 35 66 78 88 90 23 44 9</td>
</tr>
</tbody>
</table>
Lesson Reading Guide

Bar Graphs and Histograms

Get Ready for the Lesson

Read the introduction at the top of page 415 in your textbook. Write your answers below.

1. What are the fastest and slowest speeds in the table?
   - 70 mph; 40 mph

2. How can you create a visual representation to summarize the data?
   - Sample answer: Use a line plot, or a stem-and-leaf plot.

3. Do any of these representations show both the animal name and its speed?
   - Sample answer: No, neither a line plot nor a stem-and-leaf plot show both the animal name and its speed.

Read the Lesson

4. Look at Example 1. What are the things that a bar graph should have?
   - horizontal and vertical axes with labels, scale, category names, bars representing each category, and a title

5. Why are all of the bars in a histogram the same width without space between them? The intervals are equal.

Remember What You Learned

6. How is a histogram similar to a bar graph? How is it different?
   - Sample answer: Both are bar graphs in which the bars represent values, but the bars in a histogram represent the number of values within an interval.
For Exercises 1 and 2, use the table. It shows the number of species at several zoological parks.

1. Make a bar graph of the data.

**Sample answer:**

<table>
<thead>
<tr>
<th>Zoo</th>
<th>Number of Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>350</td>
</tr>
<tr>
<td>Lincoln Park</td>
<td>290</td>
</tr>
<tr>
<td>Cincinnati</td>
<td>700</td>
</tr>
<tr>
<td>Bronx</td>
<td>530</td>
</tr>
<tr>
<td>Oklahoma City</td>
<td>600</td>
</tr>
</tbody>
</table>

2. Which zoological park has the most species? **Cincinnati**

For Exercises 3 and 4, use the table at the right. It shows the number of species at 37 major U.S. public zoological parks.


**Sample answer:**

<table>
<thead>
<tr>
<th>Number of Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
</tr>
<tr>
<td>300</td>
</tr>
<tr>
<td>400</td>
</tr>
<tr>
<td>500</td>
</tr>
<tr>
<td>600</td>
</tr>
<tr>
<td>700</td>
</tr>
<tr>
<td>800</td>
</tr>
</tbody>
</table>

4. Which interval has the largest frequency? **301–400**

**HEALTH** For Exercises 5 and 6, use the graph at the right.

5. What does each bar represent? The number of Calories consumed per day by one person.

6. Determine whether the graph is a bar graph or a histogram. Explain how you know. **Bar graph; the data is not in intervals.**
Practice

Bar Graphs and Histograms

Select the appropriate graph to display each set of data: bar graph or histogram. Then display the data in the appropriate graph.

1. Ages of Children Taking Swimming Lessons
<table>
<thead>
<tr>
<th>Age</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–2</td>
<td>8</td>
</tr>
<tr>
<td>3–5</td>
<td>12</td>
</tr>
<tr>
<td>6–8</td>
<td>18</td>
</tr>
<tr>
<td>9–11</td>
<td>17</td>
</tr>
<tr>
<td>12–14</td>
<td>12</td>
</tr>
<tr>
<td>15–17</td>
<td>13</td>
</tr>
</tbody>
</table>

2. Home Run Derby 2005
<table>
<thead>
<tr>
<th>Player</th>
<th>Home Runs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bobby Abreu</td>
<td>24</td>
</tr>
<tr>
<td>Ivan Rodriguez</td>
<td>7</td>
</tr>
<tr>
<td>Carlos Lee</td>
<td>11</td>
</tr>
<tr>
<td>David Ortiz</td>
<td>17</td>
</tr>
<tr>
<td>Hee-Seop Choi</td>
<td>5</td>
</tr>
</tbody>
</table>

PET OWNERSHIP

For Exercises 3–5, use the bar graph that shows the percent of households that owned fish or birds for the years 1998, 2000, 2002, and 2004.

3. Which type of pet increased in percent ownership from 1998 to 2004? Fish

4. For every 100 households, how many more households had fish for pets than birds in the year 1998? 4 households

5. During which years did the percent ownership not change for either type of pet? 2002 and 2004

Word Problem Practice

Bar Graphs and Histograms

PUPPIES For Exercises 1 and 2, use the table below. It shows the results of a survey in which students were asked what name they would most like to give a new pet puppy.

<table>
<thead>
<tr>
<th>Name</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max</td>
<td>15</td>
</tr>
<tr>
<td>Tiger</td>
<td>5</td>
</tr>
<tr>
<td>Lady</td>
<td>13</td>
</tr>
<tr>
<td>Shadow</td>
<td>10</td>
</tr>
<tr>
<td>Molly</td>
<td>9</td>
</tr>
<tr>
<td>Buster</td>
<td>2</td>
</tr>
</tbody>
</table>

EARTH SCIENCE In Exercises 3–6, use the table below. It shows the highest wind speeds in 30 U.S. cities.

<table>
<thead>
<tr>
<th>Highest Wind Speeds (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>52 75 60 80 55 91 60 81 58</td>
</tr>
<tr>
<td>53 73 46 76 53 46 73 46 51 49</td>
</tr>
<tr>
<td>57 58 66 47 65 49 56 51 54 51</td>
</tr>
</tbody>
</table>

1. Make a bar graph to display the data.
   Sample answer:

   Favorite New Puppy Names
<table>
<thead>
<tr>
<th>Name</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max</td>
<td>15</td>
</tr>
<tr>
<td>Tiger</td>
<td>5</td>
</tr>
<tr>
<td>Lady</td>
<td>13</td>
</tr>
<tr>
<td>Shadow</td>
<td>10</td>
</tr>
<tr>
<td>Molly</td>
<td>9</td>
</tr>
<tr>
<td>Buster</td>
<td>2</td>
</tr>
</tbody>
</table>

2. Use your bar graph from Exercise 1. Compare the number of votes the name Shadow received to the number of votes the name Tiger received.
   Shadow received twice as many votes as Tiger.

3. Make a histogram of the data.

4. What is the top wind speed of most of the cities? 50–59 mph

5. How many cities recorded wind speeds of 80 miles per hour or more? 3

6. How many cities recorded their highest wind speeds at 60 miles per hour or more? 10
Answers (Lessons 8-4 and 8-5)

Enrichment

Bar Graphs and Histograms

You can use a bar graph to compare different data sets. Bar graphs can be used to show categorical data. Solid bars are used to show the values in certain categories. You can use a histogram to represent numerical data. It shows how many data points fall within certain numerical intervals.

1. These two bar graphs show the same data from the Smith family's 5-day road trip. Describe each graph by using the data from the Smith family's 5-day road trip.

   - First graph: Shows the number of miles the family traveled each day.
   - Second graph: Shows the amount of time the family spent driving during each day.

2. The following two graphs show the amount of time the family spent driving during the different days of the road trip. Use the bar graph to create a histogram. The second graph is a histogram.

   - Identify the day of the week and the number of miles driven each day.

   - Create a histogram with the appropriate intervals for miles driven per day.

3. Use the graphs to determine the average speed the Smith family drove on Wednesday.

   - Average speed = \frac{Total miles driven}{Total time spent driving}
Mixed Problem Solving

Select the Operation

For Exercises 1 and 2, use the graph that shows the amount of pitching practice time for Adam and Jordan during a particular week.

1. Who practiced more during the week and by how much time? Jordan practiced 0.5 hour more than Adam.

2. What was Adam’s average practice time per day for the five days? 1.1 hours

Use any strategy to solve Exercises 3 and 4. Some strategies are shown below.

3. LAWN TOOLS The bar graph shows the number of shovels and rakes sold during particular months at a hardware store. During which month was the number of rakes sold about twice the number of shovels sold? August

4. NUMBER THEORY 42 is subtracted from 42% of a number. The result is 42. What is the number? The number is 200.

For Exercises 5 and 6, select the appropriate operation(s) to solve the problem. Justify your solution(s) and solve the problem.

5. MONEY The value of the number of dimes is equal to the value of the number of quarters. If the total value of the quarters and dimes is $6.00, find the total number of coins.

Division and addition; 600 coins

6. SKIING Mrs. Roget is taking her family of 2 adults and 4 children skiing for the day. They need to rent ski equipment. What will it cost to ski for the day including equipment rental and lift tickets?

Addition and multiplication; $124.00
Get Ready for the Lesson

Complete the Mini-Lab at the top of page 426 in your textbook. Write your answers below:

1. By how much did the water's height change after each addition of marbles? See students' work.
2. Predict the height of the water when 30 marbles are in the drinking glass. Explain how you made your prediction. See students' work.
3. Test your prediction by placing 10 more marbles in the glass. See students' work.
4. Draw a graph of the data that you recorded in the table. See students' work.

Read the Lesson

5. In Example 1, what do the dotted lines help in finding? The lines help to match up the number you are looking for and its solution.
6. What are the benefits of a scatter plot? They show trends in data, which help in predicting outcomes.
7. How would you know if two sets of data are related when looking at their scatter plot? The two sets of data would come close to forming a straight line.

Remember What You Learned

8. Discuss line graph and scatter plots in terms of their benefits for making predictions. Sample answer: Line plots show trends over time so they help predict events in the future. Scatter plots show trends in the data and help predict the next point in a set of data.
Determine whether each data set shows a **positive**, a **negative**, or a **no relationship**. Then describe the relationship between the data sets.

1. Positive; As Carolyn's age increases, so does her income.
2. Negative; As Ryan's age increases, his physical activity decreases.
3. Positive; As Sam's speed increases, so does his gas mileage.
4. Positive; As temperature increases, crickets chirp more.
5. No relationship; As Ryan's age increases, his physical activity decreases.
For Exercises 1–3, use the table that shows the relationship between the month of the year and the number of Tamika’s classmates that have their driving permit.

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1</td>
</tr>
<tr>
<td>February</td>
<td>3</td>
</tr>
<tr>
<td>March</td>
<td>4</td>
</tr>
<tr>
<td>April</td>
<td>5</td>
</tr>
<tr>
<td>May</td>
<td>8</td>
</tr>
<tr>
<td>June</td>
<td>10</td>
</tr>
<tr>
<td>July</td>
<td>11</td>
</tr>
<tr>
<td>August</td>
<td>14</td>
</tr>
<tr>
<td>September</td>
<td>15</td>
</tr>
<tr>
<td>October</td>
<td>15</td>
</tr>
<tr>
<td>November</td>
<td>18</td>
</tr>
<tr>
<td>December</td>
<td>21</td>
</tr>
</tbody>
</table>

1. Make a scatter plot of the data. Put the months on the horizontal axis and the number of students on the vertical axis.

2. Describe the type of relationship there is between the two types of data. **Positive**

3. Why do you think this relationship exists? **Because as the year continues on, more students are old enough to obtain their driving permit.**

For Exercises 4–6, use the graph that shows the time it takes Taylor to complete a marathon.

1. Make a scatter plot of the data. Put the months on the horizontal axis and the number of students on the vertical axis.

2. Describe the type of relationship there is between the two types of data. **Positive**

3. Predict the time it will take Taylor to reach Mile 22 of the marathon and how long it will take Taylor to complete the marathon. **150 min; 170 min**

4. For how many minutes will he have run when he reaches the 8-mile mark? **60 min**

5. How many miles will he have run in 110 minutes? **15 mi**
Get Ready for the Lesson

1. Can you tell how many were surveyed? Explain. No; the graphic only gives percents of the group.

2. Describe how you could use the graph to predict how many students in your school have no television in their bedroom.
   Sample answer: Assume the students in your school are similar to those represented in the graph. Then find 46% of the number of students in your school.

Read the Lesson

3. Look up the word random in a dictionary. Write the meaning of the word as it is used in this lesson.
   Sample answer: of or designating a sample drawn from a population so that each member of the population has an equal chance to be drawn

4. In order to make predictions about a group of people, what do you need to know, according to this lesson?
   Sample answer: You need to know the results of a survey of the population and the percent of people with the desired characteristic you want to predict.

5. What are two methods for calculating a prediction about a population?
   Use the percent proportion or the percent equation.

Helping You Remember

6. Take a survey of your class, such as how many people are wearing blue today. Be sure to gather results from your whole class. Based on your results, make a prediction about all of the students in your grade level at your school. Find out the total number of students in your grade from your teacher or school office. See students’ work.
Study Guide and Intervention

Using Data to Predict

Data gathered by surveying a random sample of the population may be used to make predictions about the entire population.

Example 1

In a survey, 200 people from a town were asked if they thought the town needed more bicycle paths. The results are shown in the table. Predict how many of the 28,000 people in the town think more bicycle paths are needed.

<table>
<thead>
<tr>
<th>More Bicycle Paths Needed?</th>
<th>Response</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>yes</td>
<td>39%</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>42%</td>
</tr>
<tr>
<td></td>
<td>undecided</td>
<td>19%</td>
</tr>
</tbody>
</table>

Use the percent proportion.

\[
\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100} \quad \text{Percent proportion}
\]

\[
\frac{n}{28,000} = \frac{39}{100} \quad \text{Let } n \text{ represent the number.}
\]

Cross products: \(28,000 \times 39 = 10,920\)

So, about 10,920 people in the town think more bicycle paths are needed.

Exercises

1. **VOTES** In a survey of voters in Binghamton, 55% of those surveyed said they would vote for Armas for city council. If 24,000 people vote in the election, about how many will vote for Armas? **13,200 people**

2. **LUNCH** A survey shows that 43% of high school and middle school students buy school lunches. If a school district has 2,900 high school and middle school students, about how many buy school lunches? **1,247 students**

3. **CLASS TRIP** Students of a seventh grade class were surveyed to find out how much they would be willing to pay to go on a class trip. 24% of the students surveyed said they would pay $21 to $30. If there are 360 students in the seventh grade class, about how many would be willing to pay for a trip that costs $21 to $30? **About 86 students**

4. **PIZZA** For Exercises 4–6, use the table at the right. It shows the results of a survey in which a random sample of seventh graders at Kiewit Middle School were asked to name their favorite pizza topping.

<table>
<thead>
<tr>
<th>Pizza Topping</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>pepperoni</td>
<td>46%</td>
</tr>
<tr>
<td>peppers</td>
<td>28%</td>
</tr>
<tr>
<td>olives</td>
<td>8%</td>
</tr>
<tr>
<td>onions</td>
<td>2%</td>
</tr>
<tr>
<td>pineapple</td>
<td>4%</td>
</tr>
<tr>
<td>mushrooms</td>
<td>12%</td>
</tr>
</tbody>
</table>

4. There are 32 students in Mrs. Chen’s seventh grade class. Predict how many would choose olives as their favorite topping. **About 3 students**

5. There are 210 seventh grade students eating lunch in the cafeteria. How many of them would choose peppers as their favorite topping? **About 59 students**

6. Predict how many of the 524 seventh graders at Kiewit Middle School would choose pepperoni as their favorite pizza topping. **About 241 seventh graders**

7. **BACKPACKS** A survey showed that 78% of students who take a bus to school carry a backpack. Predict how many of the 654 students who take a bus also carry a backpack. **About 510 students**
**Word Problem Practice**

**Using Data to Predict**

1. **SHOES** The table shows the results of a survey in which seventh graders were asked how many pairs of shoes they own. Predict how many of the 632 seventh graders at Seneca West Middle School own more than 7 pairs of shoes.

<table>
<thead>
<tr>
<th>Shoes</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 or less</td>
<td>10%</td>
</tr>
<tr>
<td>4</td>
<td>20%</td>
</tr>
<tr>
<td>5</td>
<td>21%</td>
</tr>
<tr>
<td>6</td>
<td>19%</td>
</tr>
<tr>
<td>7</td>
<td>19%</td>
</tr>
<tr>
<td>more than 7</td>
<td>8%</td>
</tr>
</tbody>
</table>

**About 51 seventh graders**

2. **ACTIVITIES** Of the students listed as members of a high school academic team, 75% were involved in sports, speech, music or debate. If 111 students were listed as part of the teams, how many were involved in sports, speech, music or debate? **About 83 students**

3. **MOVIEGOERS** A research study found that about 63% of people 18 or older who go to the movies at least once a month own a personal computer. Out of 500 people 18 and older who go to the movies once or more a month, how many of them would you expect to own a personal computer? **315 people**

4. **HAIR** A survey showed that 37% of people 12 to 17 years old use hair gel. Predict how many of the 30 students in Mr. Avalon’s ninth grade class use hair gel. **About 11 students**

5. **GRADUATION** A survey of first-year students at North Carolina State University showed that about 73% expect to complete their degree in 4 years. If there are 3,333 first-year students, how many of them expect to complete their degree in 4 years? **About 2,443 students**

6. **INTERNET** A recent survey conducted by the Millard school district showed that 87% of households of students have Internet access at home. If there are 19,000 Millard households, how many have Internet access? **16,530 households**

---

**Mathematics**

**Answers**

**Chapter 8**

**Lesson 8-7**

**Practice**

**Using Data to Predict**

1. 85% of commuters use the expressway. Predict how many commuters out of 750 commuters will use the expressway.

\[ a. \quad n = 0.85 \cdot 750 \]

2. 750% of 85 is what number? **C**

3. 85 commuters is what percent of 750 commuters? **B**

4. **ESKIMOS** In the year 2000, the population of Alaska was about 627 thousand. Predict the number of Eskimos in Alaska if the Eskimo population was about 7.5% of the population of Alaska. **47 thousand**

5. **DOGS** A survey showed that about 40% of American households own at least one dog. Based on that survey, how many households in a community of 800 households own at least one dog? **320 households**

**CAR REPAIRS** For Exercises 6-8, use the graph that shows the percent of all repairs for 3 car repair problems at a car repair shop.

6. Suppose a mechanic repairs 478 cars. Predict how many repairs will be made on transmissions. **43 repairs**

7. For every 100 repairs, predict how many more repairs will be made on a brake system problem than on an electrical problem. **7 repairs**

8. Predict the percent of repairs that will be one of the three problems in the graph. **44% of repairs**
**Scientific Calculator Activity**

### Leaving a Tip

The percent function on a calculator can be used to decide how much of a tip to leave a server at a restaurant. It can also be used to determine the total bill for a meal.

**Example**
The Edwards family had a meal at a local restaurant. The bill was $39.95. There was an 8% meal tax, and they leave a tip of 15% of the bill, not including tax. What was the amount of the tip and the total bill?

- The tip is 15% of the bill for the meal.
  \[ 39.95 \times 0.15 = 5.9925 \]
- They decided to leave a $6.00 tip.
- The total bill is found by adding the tax, the amount of the bill, and the tip.
  \[ (39.95 + 3.196) + 6 = 59.145 \]
- The total bill was $59.15.

### Exercises

Find the amount of the tip and the total bill for each meal. Round your answer for the tip to the nearest dollar. Round your answer for the total bill to the nearest cent.

1. **bill:** $72  
   - tip: 12%  
   - tax: 6%  
   - $9; $85.32
2. **bill:** $43  
   - tip: 15%  
   - tax: 8%  
   - $6; $52.44
3. **bill:** $79.95  
   - tip: 14%  
   - tax: 8%  
   - $11; $97.35
4. **bill:** $29.95  
   - tip: 15%  
   - tax: 7%  
   - $4; $36.05
5. **bill:** $99  
   - tip: 15%  
   - tax: 9%  
   - $15; $122.91
6. **bill:** $129.50  
   - tip: 10%  
   - tax: 5%  
   - $13; $148.98
7. **bill:** $182.50  
   - tip: 10%  
   - tax: 6%  
   - $18; $211.45
8. **bill:** $41.00  
   - tip: 7%  
   - tax: 7%  
   - $6; $49.87

---

**Can You Predict The Future?**

Many businesses need to be able to accurately predict the choices their customer will make. Their predictions are often based on survey results of a small population, which they apply to a larger population.

Suppose that school administrators want to know whether new technologies improve student achievement. They ask you to survey the students in your class.

**SURVEY**
1. Which of the following technologies do you have: personal computer, electronic organizer, cellular phone, internet access?
2. Which, if any, do you use to help with your school work?
3. What other technologies do you think might be helpful when completing your school work?

Based on your results from the students in your class, predict the following if there are 212 students in your grade, and a total of 639 students in the school.

**Exercises**

1. How many students in your grade have
   - a. a personal computer?  
   - b. an electronic organizer?  
   - c. a cellular phone?  
   - d. internet access?
2. What percent of students in the entire school will have all four of the technologies asked about in the survey?
3. Which technology is used most often to help complete school work? Predict the number of students in your grade that use this technology when completing their school work.
4. Based on the results of your survey, what other type of technology would most students use to complete their school work? How many students in your school would use this technology?
5. Based on the results of your survey, what predictions or recommendations would you make to your school administrators on how to improve student achievement?
Lesson Reading Guide

Using Sampling to Predict

Get Ready for the Lesson

Read the introduction at the top of page 438 in your textbook. Write your answers below.

1. Suppose she decides to survey the listeners of a rock radio station.
   Do you think the results would represent the entire population?
   No; listeners of a rock radio station will probably prefer a rock music ring tone more than other ring tones.

2. Suppose she decides to survey a group of people standing in line for a symphony. Do you think the results would represent the entire population?
   No; people standing in line for a symphony will probably prefer a classical music ring tone than other ring tones.

3. Suppose she decides to mail a survey to every 100th household in the area. Do you think the results would represent the entire population? Explain.
   Yes; people of all ages and backgrounds are more likely to be represented.

Read the Lesson

4. Match the type of sample with its example. Put the correct letter on the line.

   - simple random sample
   - stratified random sample
   - systematic random sample
   - convenience sample
   - voluntary response sample

   a. Every 10th person is given a survey.
   b. Only those who volunteer take a survey.
   c. Names are picked randomly out of a hat.
   d. A store manager surveys his first 20 customers.
   e. 5 residents are randomly surveyed from each floor of a 25 story apartment building.

Remember What You Learned

5. If you are conducting a survey, explain why it is important to have an unbiased sample.
   Only through an unbiased sample can our results be valid.

Chapter 8

A23

Glencoe California Mathematics, Grade 6

Lesson (Lesson 8-8)
Determine if the sample method is valid (unbiased) and if so, use the results to make predictions. If the sample is not valid (biased), write not valid on the line and explain why.

1. A representative from the cable company randomly calls 100 households to determine the number of customers who receive movie channels. Of these, 15% do have movie channel access. If there are 2,300 customers total, how many can be expected to have the movie channels?

It is valid, and 345 customers would have movie channels.

2. An electronics store just received a huge shipment of video games. Kenny has been put in charge of making sure the goods are not damaged. There are 350 boxes and 50 games in each box. Kenny decides to take the nearest 5 boxes and check for damages. He finds only 2 damaged games, so what can he predict for the total number of damaged games in the boxes?

Kenny's sample is not valid because it is a convenience sample.

3. Taylor was given the following problem:
   A researcher, who was trying to link after-school students from 20 different schools around the country. He found that 74% of students were involved in after-school sports. How many students surveyed were involved in sports?

This is how Taylor solved the problem:

\[
\begin{align*}
50 & \times 20 & = 1,000 \\
74 & \times 74 & = 5,476 \\
1,000 & & 74,000 \\
& & 74,000 \\
\end{align*}
\]

It's valid because it is a systematic random sample and there were 74,000 students.

Explain what Taylor did wrong.

Taylor did not multiply 74% as a decimal. If she did, the answer would be 740. Also, it is a stratified random sample.
Word Problem Practice

Using Sampling to Predict

Use the word problem and table to answer the questions below.

Miguel is the manager of a clothing store. He wants to find out what are the most popular styles of men’s pants and how many of each to order. He decides to survey every 10th man that walks in over a two-week period. Here are his results.

<table>
<thead>
<tr>
<th>Pant Style</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jeans</td>
<td>52</td>
</tr>
<tr>
<td>Khakis</td>
<td>31</td>
</tr>
<tr>
<td>Slacks</td>
<td>17</td>
</tr>
</tbody>
</table>

1. What type of sample does Miguel use for his survey?
   **Systematic random sample**

2. What percentage of the customers surveyed prefer khakis?
   **31%**

3. What percentage of the customers surveyed prefer jeans?
   **52%**

4. If Miguel has 1,000 male customers over a two-week period, how many pairs of jeans will he predict to sell?
   **520 pairs of jeans**

5. If he has 1,300 customers in a two-week period, how many pairs of slacks will he predict to sell?
   **221 pairs of slacks**

6. Why would Miguel's sample not have been valid if he had decided to survey only the first ten people to walk in?
   **This would have been a convenience sample which is biased and not valid.**

Using Sampling to Predict

According to the bar graph below, sports video game companies are leading in games sold to children and adults throughout the country. If these companies want to continue to lead in sales they will have to make sure they create games with graphics and features that their customers want. One way to do that is through customer surveys.

In the space below create your own customer survey for a video game. Make sure to ask questions that will give you information to create the best game possible.

**Answers will vary.**
WEEKLY CHORES The line graphs below show the total hours Salomon spent doing his chores one month. Which graph would be best to use to convince his parents he deserves a raise in his allowance? Explain.

He should use graph A because it makes the total hours seem much larger.

PROFITS For Exercises 1 and 2, use the graphs below. It shows a company’s profits over a four-month period.

1. Which graph would be best to use to convince potential investors to invest in this company? Graph A

2. Why might the graph be misleading? There is no vertical scale.

Remember What You Learned

6. Missing labels on graphs and uneven intervals on a scale are two ways a set of statistics can be misleading. Listen for a statistic used on the radio or in a newspaper. Is it a reasonable statement? What other information might you like to have before you consider a statistic to be reasonable?

See students’ work.
1. INCOME The bar graphs below show the total U.S. national income (nonfarm). Which graph could be misleading? Explain.

Graph B; Sample answer: The scale on the vertical axis does not have equal intervals. It makes the income growth appear to be slower.

2. Find the mean, median, and mode of the data. 2,599; 3,190; none

3. Which measure of central tendency is misleading in describing the miles of shoreline for the states? Explain. The mean is misleading. Sample answer: All states but one have over 3,000 miles of shoreline. The outlier of 89 causes the mean to be a poor choice to describe the data.

4. Which measure of central tendency most accurately describes the data? median

5. Explain how this graph may be misleading. Sample answer: The elevation on the graph begins with 16,500 feet, not 0 feet.

6. BODY TEMPERATURE The graphs below show the hourly body temperature for a hospital patient. Which graph would be more helpful to the doctor in showing the change in body temperature? Explain.

Graph B; Sample answer: Since body temperature only fluctuates about 5°F above and below normal body temperature, a smaller temperature scale better shows the small changes in body temperature.
Enrichment 8-9

Chapter 8

Glencoe California Mathematics, Grade 6

Lesson 8–9

Misleading Statistics

We hear numbers and statistics every day. A radio station says, “We’re number 1!” A store advertises, “Lowest prices in town!” The radio station and the store want us to believe their claims. But should we? Sometimes advertisers use statistics that are accurate, but do not tell the whole story. They use misleading statistics to help sell their products. What makes the statistics misleading is not what is said, but what is not said.

1. Explain why a store’s advertisement saying it has the “lowest prices in town” may be misleading. Sample answer: The store may have the lowest price on one product, but the advertisement suggests it has the lowest prices on all products.

2. Fode has a start-up internet business. One day, he had 1000 hits to his web site. He told advertisers that he had “30,000 hits each month.” Why might this statistic be misleading? Sample answer: He used statistics from one day only. That one day may have been higher than usual.

3. Graphs can also be misleading. A consumer group wants to show that the price of gasoline has “skyrocketed” over the past five years. The group made this line graph from the data in the table below.

   Why is this graph misleading? Sample answer: The y-axis starts at $1.20 instead of 0, so the intervals on the y-axis are large.

4. Graph the data from Exercise 3 on the grid at the right. How does your graph that starts the y-axis scale at 0 compare to the one above? Sample answer: The line has a flatter slope so the change in cost does not seem as great.
The window and zoom functions on a graphing calculator can be used to change the view of a graph. These functions are most often used to help you better see a graph or a portion of a graph. Using these functions can also change the appearance of a graph.

The table at the right shows the mean number of pets for students surveyed.

<table>
<thead>
<tr>
<th>Student's Age</th>
<th>Mean No. of Pets</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>3</td>
</tr>
</tbody>
</table>

**Step 1**

Clear all lists by pressing 2nd [MEM] 4 Enter. Enter the data. Then follow the instructions to see how the window and zoom features can change the way your graph looks.

Enter: 2nd [STAT PLOT] ENTER ENTER ENTER ENTER

Enter the data from the table under L1 and L2.

Zoom 9

The display should show a graph similar to the one at the right. This is the optimal view. It shows all of the graph on the screen as large as possible.

**Step 2**

When you press WINDOW, you will see several options. Xmín is the least value shown on the graph for X, or the age of the students. Xmax is the greatest value shown. Likewise, Ymín and Ymax are the least and greatest values of Y, or the mean number of pets. Set the values in the window as shown.

**Step 3**

Press GRAPH. Notice how the graph has changed. The data did not change at all, only the way they appear on the screen.

Continue to change the values using the window function. Describe how your changes affect the way the graph appears on the screen.

Students should notice that the greater the values entered for Xmax and Ymax, the smaller the graph will appear on the screen. If they enter values for Xmin greater than 5, Xmax less than 14, Ymin greater than 1, or Ymax less than 3, the calculator will only show a portion of the graph or none of the graph. Students should see that this happens because they have cut off some or all of the data by making those changes.
Chapter 8 Assessment Answer Key

Quiz 1 (Lessons 8-1 and 8-3)  
Page 67

1. 110

70.8-70; 60; Sample answer: Mean and median; more than half the prices are greater than $60

2. ________

3. 12

4. 31

Quiz 2 (Lessons 8-4 and 8-5)  
Page 67

the magnitude of major earthquakes worldwide

1. ________

2.  

Major Earthquakes

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>7.0-7.3</td>
</tr>
<tr>
<td>8</td>
<td>7.4-7.7</td>
</tr>
<tr>
<td>6</td>
<td>7.8-8.1</td>
</tr>
<tr>
<td>4</td>
<td>8.2-8.5</td>
</tr>
</tbody>
</table>

3. B

4. Monday

5. 202 min.

6. Thursday

Quiz 3 (Lessons 8-6 and 8-7)  
Page 68

1.  

Sample answer: 140 min

2. 9,071 adults

3. 172 people

4. about 440

Mid-Chapter Test  
Page 69

1. A

2. J

3. D

4. H

5. $4; $3; $1

Quiz 4 (Lessons 8-8 and 8-9)  
Page 68

1. 39 students

2.  

≈ 36%

3. 19

Sample answer: A has about twice as many lost pieces as B, but the size of the larger symbol is more than twice the size of the smaller.

4.  

6.  

Sample answer: cluster 2%–5%; gap 11%–19%; outliers at 8, 11, and 19

7. 8, 11, and 19

8. 17%
Chapter 8 Assessment Answer Key

Vocabulary Test
Page 70

1. _____ data ______
2. _____ line graph ______
3. _____ scatter plot ______
4. _____ line plot ______
5. _____ measures of central tendency ______
6. _____ mode ______
7. _____ bar graph ______
8. _____ histogram ______

Sample answer: Data values that are much less than or much greater than the rest of the data.

9. _____ ______

Sample answer: The difference between the greatest and least numbers in a data set

10. _____ ______

Sample answer: A histogram is a special kind of bar graph.

Form 1
Page 71

1. _____ C ______
2. _____ F ______
3. _____ D ______
4. _____ F ______

Page 72

11. _____ A ______
12. _____ H ______
13. _____ B ______
14. _____ F ______
15. _____ D ______
16. _____ G ______
17. _____ C ______
18. _____ G ______
19. _____ B ______
20. _____ J ______

B: ______

Sample answer: A histogram is a special kind of bar graph.
### Chapter 8 Assessment Answer Key

<table>
<thead>
<tr>
<th>Form 2A Page 73</th>
<th>Form 2B Page 75</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A</td>
<td>1. A</td>
</tr>
<tr>
<td>2. G</td>
<td>2. G</td>
</tr>
<tr>
<td>3. C</td>
<td>3. C</td>
</tr>
<tr>
<td>4. H</td>
<td>4. G</td>
</tr>
<tr>
<td>5. A</td>
<td>5. A</td>
</tr>
<tr>
<td>6. F</td>
<td>6. F</td>
</tr>
<tr>
<td>7. D</td>
<td>7. C</td>
</tr>
<tr>
<td>8. J</td>
<td>8. F</td>
</tr>
<tr>
<td>10. F</td>
<td>10. G</td>
</tr>
<tr>
<td>B: 6 games</td>
<td>B: 8 games</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Form 2A Page 74</th>
<th>Form 2B Page 76</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. A</td>
<td>13. C</td>
</tr>
<tr>
<td>15. B</td>
<td>15. A</td>
</tr>
<tr>
<td>16. F</td>
<td>16. G</td>
</tr>
<tr>
<td>17. B</td>
<td>17. D</td>
</tr>
<tr>
<td>18. F</td>
<td>18. F</td>
</tr>
<tr>
<td>20. H</td>
<td>20. F</td>
</tr>
</tbody>
</table>

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Chapter 8 Assessment Answer Key

Form 2C
Page 77

1. 130,000

2. 143,000

Sample answer: $2,800

3. 2.4; 2.4; 2.4

4. Texas Rivers

5. categories, rivers; lengths of the rivers

6. 19

7. $40

8. $32, $24

Most of the prices are clustered from $23 to $49.

9. 24.75; 26; no mode

Sample answer: mean and median, because more than half of the items are greater than 24

12. Sample answer: cluster 9–15; gaps 0–6 and 15–21; outliers 0, 21, and 22

13. Sample answer: Most of the students own 9–15 DVDs.

14. The conclusion is valid. This is a systematic random sample.

15. The conclusion is valid. This is a systematic random sample.

16. 40

Graph A; The increases in profits have been exaggerated by the inconsistent vertical scale.

17. Sample answer: the mean; the median and mode since they would not change

B:
Chapter 8 Assessment Answer Key

Form 2D
Page 79

1. ______ 119,000

2. ______ 94,500

Sample answer: 1,700 bushels

4. ______ 8.3; 8.2; 8.1

5. Monthly Expenditures

<table>
<thead>
<tr>
<th>Dollars</th>
<th>Food</th>
<th>Rent</th>
<th>Utilities</th>
<th>Entertainment</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>200</td>
<td>600</td>
<td>800</td>
<td>400</td>
</tr>
<tr>
<td>200</td>
<td>600</td>
<td>800</td>
<td>400</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>600</td>
<td>400</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

horizontal: expense categories; vertical: the dollars spent monthly.

7. ______ 19

8. ______ 4.5 h

9. ______ 2.4 h; 3.5 h

Sample answer: Most of the values are clustered from 1.0 hours to 3.8 hours.

10. ______

11. ______ 12 and 15

Sample answer: Mean; there is no mode in either case.

12. ______

13. ______

Sample answer: cluster 0–5; gap 5–9; outliers 9 and 11

14. ______

15. ______

16. ______ 16

The conclusion is valid. This is a systematic random sample.

17. ______

The conclusion is invalid. This is a biased, voluntary response sample.

18. ______

Graph B; The decreases in profits have been minimized by the inconsistent vertical scale.

19. ______

Sample answer: Mean; there is no mode in either case.
Chapter 8 Assessment Answer Key

Form 3
Page 81

1. Sample answer: vertical axis does not start at zero.

2. 682 s or 11 min 22 s; 300 s or 5 min

3.  6.1

4.  1/2 Gallon of Milk

5. Sample answer: $1.15

6.  1.9

7.  6.1

Sample answer: clusters 6.0–6.3 and 6.8–7.1; gaps 6.3–6.8 and 7.1–7.4; no outliers

8. Sample answer: clusters 6.0–6.3 and 6.8–7.1; gaps 6.3–6.8 and 7.1–7.4; no outliers

9. Sample answer: clusters 6.0–6.3 and 6.8–7.1; gaps 6.3–6.8 and 7.1–7.4; no outliers

10. Sample answer: vertical axis does not start at zero.

Page 82

11. Sample answer: Mean; the population of Tokyo is much larger than the others.

12. no mode

13. 213 = 23

14. 24; 24

15. 11,500

16. 10,500

Sample answer: If there are both values that are greater and those that are less, then the mean may not be affected.

Example: Data: 2, 499, 500, 501, 998; mean = 500; mean with 2 and 998 removed = 500

B:
## 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 8 Assessment Answer Key

Page 83, Extended-Response Test
Sample Answers

In addition to the scoring rubric found on page A36, the following sample answers may be used as guidance in evaluating extended-response assessment items.

1. a. 46
   
   b. Sample answer: About 45, because the mean total score is decreasing about 0.5 points per year.
   
   c. The distance from 0 to 40 is the same as the distance from 40 to 42.

2. a. Sample answer: Data that are grouped closely together are called a cluster.

   ![Stem-and-Leaf Plot]

   b. Sample answer: The mean of a set of data is the arithmetic average. The median of a set of data is the middle number when the data are arranged in numerical order or the average of the middle two data if there are an even number of data in the set. The mode of a set of data is the number or item that appears most often.

   mean: \[11 + 29 + 54 + 59 + 35 + 41 + 46 + 33 + 47 + 60 + 54 + 46 + 49 + 46 = 610\]
   \[\frac{610}{14} = 43.6\]

   median: 46

   mode: 46

   c. Sample answer: Find the least and greatest data values: 11 and 60. The least data value has a 1 in the tens place, and the greatest value has a 6 in the tens place. List the digits 1 to 6 in order from least to greatest. The leaves are the corresponding digits in the ones place for each stem. Write every leaf, in order from least to greatest. Include a key to the data.

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

   6|0 = 60 home runs

3. Sample answer: To analyze data means to describe, summarize, and compare data. Some methods for doing this include using graphs and using measures of central tendency.
## Chapter 8 Assessment Answer Key

### Standardized Test Practice

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>◯ ◯ ● ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>◯ ◯ ● ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>◯ ◯ ● ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>● ◯ ◯ ●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>● ◯ ◯ ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>● ◯ ◯ ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>◯ ◯ ◯ ●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>◯ ◯ ● ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>◯ ◯ ● ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>● ◯ ◯ ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>● ◯ ◯ ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>● ◯ ◯ ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>◯ ◯ ◯ ●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>◯ ◯ ● ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>● ◯ ◯ ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>● ◯ ◯ ◯</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 8 Assessment Answer Key

Standardized Test Practice
Page 86

17. 0.405
   223.5 million miles or
   223,500,000 miles

18. 223,500,000 miles

19. Sample answer: 28

20a. Sample answer: The greatest amount of rain is 30 mm and the least amount of rain is 3 mm; range: 30 – 3 = 27 mm.

20b.
\[
\frac{6\text{th term} + 7\text{th term}}{2} = \frac{21 + 21}{2} = 21
\]