Chapter 6
Resource Masters
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>MHID</th>
<th>ISBN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Guide and Intervention Workbook</td>
<td>0-07-878871-4</td>
</tr>
<tr>
<td>Skills Practice Workbook</td>
<td>0-07-878873-0</td>
</tr>
<tr>
<td>Practice Workbook</td>
<td>0-07-878875-7</td>
</tr>
<tr>
<td>Word Problem Practice Workbook</td>
<td>0-07-878877-3</td>
</tr>
</tbody>
</table>

Spanish Versions

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

Answers for Workbooks  The answers for Chapter 6 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 6 Test Form 2A and Form 2C.
Teacher’s Guide to Using the  
Chapter 6 Resource Masters

The Chapter 6 Resource Masters includes the core materials needed for Chapter 6. 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 6-1. 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 6 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.
**6 Student-Built Glossary**

This is an alphabetical list of new vocabulary terms you will learn in Chapter 6. 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>cross products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>equivalent ratios</td>
<td></td>
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<tr>
<td>gram</td>
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<td>kilogram</td>
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<td>liter</td>
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<td></td>
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<tr>
<td>meter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>metric system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocabulary Term</td>
<td>Found on Page</td>
<td>Definition/Description/Example</td>
</tr>
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<td>---------------------------------</td>
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<tr>
<td>proportional</td>
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<tr>
<td>rate</td>
<td></td>
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<tr>
<td>ratio</td>
<td></td>
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<tr>
<td>scale</td>
<td></td>
<td></td>
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<tr>
<td>scale drawing</td>
<td></td>
<td></td>
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<tr>
<td>scale factor</td>
<td></td>
<td></td>
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<tr>
<td>scale model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>unit rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>unit ratio</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dear Parent or Guardian:

In our math class, we try to relate things we learn in the classroom to the real world. Ratios, rates, and proportions are all around us. We use ratios to compare numbers. We use rates to compare quantities with different units. And we use proportions to solve ratios and rate problems.

In Chapter 6, Ratios and Proportions, your child will learn about ratios, rates, and proportions. Your child will learn how to convert ratios to fractions, convert decimals to percents, solve proportions, and solve problems using the percent proportion. In addition, your child will learn to change customary units and to solve problems by drawing a diagram. 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 6 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 __________
Family Activity

Standards Practice

Fold the page along the dashed line. Work each problem on another piece of paper. Then unfold the page to check your work.

1. A nutrition label on the back of a bag of potato chips states that there are 130 calories per serving. One serving is 10 potato chips. Eddie ate 70 potato chips. Use a proportion to find how many calories are in the 70 chips.

How many calories were in the chips Eddie ate?

A) 700 calories
B) 910 calories
C) 1,300 calories
D) 9,100 calories

Solution

1. Hint: In a proportion, the top and bottom numbers are always multiplied or divided by the same number to get an equivalent ratio.

The following proportion can be used to find the number of calories in the chips Eddie ate.

\[
\frac{130 \text{ calories}}{10 \text{ chips}} = \frac{? \text{ calories}}{70 \text{ chips}}
\]

Since 70 is 7 times more than 10, 130 must also be multiplied by 7 to find the number of calories in 70 chips.

\[130 \times 7 = 910\]

The answer is B.

2. Joan had $500 in her savings account last month. After putting some more money into her account this month, she now has 110% of that amount. Use the grids below to help you determine how much money Joan has in her saving account.

How much money does Joan have now?

A) $450
B) $500.50
C) $550
D) $600

Solution

2. Hint: You can use a fraction of the total or a percentage to solve this problem.

The area of the second grid that is shaded represents \(\frac{1}{10}\) of a whole, or 10%. Each square of the first whole represents $5. So the 10 shaded squares in the second whole represent $50.

\[\text{Total} = \text{Original} + \text{Interest} = \text{Future Value}\]

\[\text{Future Value} = 500 + 50 = 550\]

The answer is C.
Estimado padre o apoderado:

En nuestra clase de matemáticas, tratamos de relacionar lo que aprendemos en el aula con el mundo real. Estamos rodeados de razones, tasas y proporciones. Usamos razones para comparar cantidades con unidades diferentes. Y usamos proporciones para resolver problemas de razones y tasas.

En el Capítulo 6, Razones y proporciones, su hijo(a) aprenderá acerca de razones, tasas y proporciones. Su hijo(a) aprenderá cómo convertir razones a fracciones, decimales a porcentajes, a resolver proporciones y a resolver problemas con la proporción porcentual. Además, su hijo(a) aprenderá a convertir unidades inglesas y a resolver problemas trazando un diagrama. 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 6. 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. La etiqueta alimenticia al dorso de una bolsa de papitas fritas informa que cada ración tiene 130 calorías. Una ración equivale a 10 papitas. Eddie comió 70 papitas fritas. Usen una proporción para calcular cuántas calorías hay en 70 papitas. ¿Cuántas calorías tenían las papitas fritas que comió Eddie?

A 700 calorías
B 910 calorías
C 1,300 calorías
D 9,100 calorías

2. Joan tenía $500 en su cuenta de ahorros el mes pasado. Después de depositar más dinero en su cuenta este mes, ahora tiene 110% de la cantidad anterior. Usen los cuadriculados siguientes como ayuda para determinar cuánto dinero tiene Joan en su cuenta de ahorros.

¿Cuánto dinero tiene Joan ahora?
A $450
B $600
C $500.50
D $550

Solución

1. Ayuda: En una proporción, los números superior e inferior siempre se multiplican por o se dividen entre el mismo número para obtener una razón equivalente.

Puede usarse la siguiente proporción para calcular el número de calorías en las papitas que se comió Eddie:

\[
\frac{130 \text{ calorías}}{10 \text{ papitas}} = \frac{? \text{ calorías}}{70 \text{ papitas}}.
\]

Como 70 es 7 veces más que 10, 130 debe multiplicarse también por 7 para calcular el número de calorías en 70 papitas.

\[
130 \times 7 = 910
\]

La respuesta es B.

2. Ayuda: Pueden usar una fracción del total o un porcentaje para resolver este problema.

El área del segundo cuadriculado sombreado representa \(\frac{1}{10}\) del todo, o 10%. Cada cuadrado del primer todo representa $5. De modo que los 10 cuadrados sombreados en el segundo todo representan $50.

\[
500 + 50 = 550
\]

La respuesta es D.
# Anticipation Guide

## Ratio and Proportion

### Step 1

**Before you begin Chapter 6**

- 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>To determine if two ratios are equivalent, write both ratios in simplest form.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>A rate is called a unit rate only when it has a denominator of 1 unit.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>When converting larger units to smaller units in the Customary measurement system division is used.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Since there are 2 cups in a pint, 8 cups is equal to 4 pints.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>The cross products of $\frac{2}{5}$ and $\frac{7}{8}$ are 14 and 40.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>A blue print drawing of a house with a scale of 1 inch = 6 feet would be larger than a blue print drawing of the same house with a scale of $\frac{1}{4}$ inch = 1.5 feet.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>$\frac{1}{3}$ is the same as $33\frac{1}{3}%$.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>To write a fraction as a percent you could first write the fraction as a decimal, and then convert the decimal to a percent.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>To divide a decimal by 100, move the decimal point 2 places to the right.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Percents can only be written with whole numbers.</td>
<td></td>
</tr>
</tbody>
</table>

### Step 2

**After you complete Chapter 6**

- 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
### Razones y proporciones

#### PASO 1

**Antes de comenzar el Capítulo 6**

- 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</th>
<th>Enunciado</th>
<th>PASO 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, D o NS</td>
<td></td>
<td>A o D</td>
</tr>
<tr>
<td>1.</td>
<td>Para determinar si dos razones son equivalentes, escribe ambas razones en</td>
<td>1.</td>
</tr>
<tr>
<td></td>
<td>forma reducida.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Una tasa se llama tasa unitaria sólo cuando tiene un denominador de 1</td>
<td>2.</td>
</tr>
<tr>
<td></td>
<td>unidad.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Se usa la división para convertir unidades grandes a unidades pequeñas en</td>
<td>3.</td>
</tr>
<tr>
<td></td>
<td>el sistema inglés de medidas.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Como hay dos tazas en una pinta, 8 tazas equivalen a 4 pintas.</td>
<td>4.</td>
</tr>
<tr>
<td>5.</td>
<td>El producto cruzado de $\frac{2}{5}$ y $\frac{7}{8}$ es 14 y 40.</td>
<td>5.</td>
</tr>
<tr>
<td>6.</td>
<td>Los planos de una casa con una escala de 1 pulgada = 6 pies serían más</td>
<td>6.</td>
</tr>
<tr>
<td></td>
<td>grandes que los planos de la misma casa con una escala de $\frac{1}{4}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pulgada = 1.5 pies.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>$\frac{1}{3}$ es lo mismo que $33\frac{1}{3}$.</td>
<td>7.</td>
</tr>
<tr>
<td>8.</td>
<td>Para escribir una fracción como porcentaje, escribe primero la fracción</td>
<td>8.</td>
</tr>
<tr>
<td></td>
<td>como decimal y convierte el decimal a porcentaje.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Para dividir un decimal entre 100, mueve el punto decimal dos lugares a</td>
<td>9.</td>
</tr>
<tr>
<td></td>
<td>la derecha.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Los porcentajes sólo se pueden escribir con números enteros.</td>
<td>10.</td>
</tr>
</tbody>
</table>

#### PASO 2

**Después de completar el Capítulo 6**

- 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.
Lesson Reading Guide

Ratios

Get Ready for the Lesson

Read the introduction at the top of page 282 in your textbook. Write your answers below.

1. Write the student-teacher ratio of Prairie Lake Middle School as a fraction. Then write this fraction with a denominator of 1.

2. Can you determine which school has the lowest student-teacher ratio by examining just the number of teachers at each school? Just the number of students at each school? Explain.

Read the Lesson

For Exercises 3 and 4, review the introduction to this lesson.

3. What two things are being compared?

4. What is the comparison of the size of the larger school to the size of the smaller school called?

5. When you simplify a ratio written as an improper fraction, should you rewrite the fraction as a mixed number?

Remember What You Learned

6. Comparing measurements requires you to know how to convert measurements easily. Complete the following table to help you remember some common conversions.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Equivalent Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 foot</td>
<td>_______ inches</td>
</tr>
<tr>
<td>1 yard</td>
<td>_______ feet</td>
</tr>
<tr>
<td>1 year</td>
<td>_______ weeks</td>
</tr>
<tr>
<td>1 pound</td>
<td>_______ ounces</td>
</tr>
<tr>
<td>1 gallon</td>
<td>_______ quarts</td>
</tr>
<tr>
<td>1 quart</td>
<td>_______ pints</td>
</tr>
</tbody>
</table>
**6-1  Study Guide and Intervention**  

**Ratios**

Any ratio can be written as a fraction. To write a ratio comparing measurements, such as units of length or units of time, both quantities must have the same unit of measure. Two ratios that have the same value are **equivalent ratios**.

**Example 1**  
Write the ratio 15 to 9 as a fraction in simplest form.

\[
\frac{15}{9} = \frac{5}{3}
\]

Written as a fraction in simplest form, the ratio 15 to 9 is \(\frac{5}{3}\).

**Example 2**  
Determine whether the ratios **10 cups of flour in 4 batches of cookies** and **15 cups of flour in 6 batches of cookies** are equivalent ratios.

Compare ratios written in simplest form.

\[
\begin{align*}
10 \text{ cups}:4 \text{ batches} &= \frac{10}{4} = \frac{5}{2} \\
15 \text{ cups}:6 \text{ batches} &= \frac{15}{6} = \frac{5}{2}
\end{align*}
\]

Since the ratios simplify to the same fraction, the ratios of cups to batches are equivalent.

**Exercises**

Write each ratio as a fraction in simplest form.

1. 30 to 12  
2. 5:20
3. 49:42  
4. 15 to 13
5. 28 feet:35 feet  
6. 24 minutes to 18 minutes
7. 75 seconds:150 seconds  
8. 12 feet:60 feet

Determine whether the ratios are equivalent. Explain.

9. \(\frac{3}{4}\) and \(\frac{12}{16}\)  
10. 12:17 and 10:15  
11. \(\frac{25}{35}\) and \(\frac{10}{14}\)

12. 2 lb:36 oz and 3 lb:44 oz  
13. 1 ft:4 in. and 3 ft:12 in.
Skills Practice

Ratios

Write each ratio as a fraction in simplest form.

1. 14 to 6
2. 18:3
3. 4:22
4. 7:21
5. 18:12
6. 20 to 9
7. 25 to 20
8. 4:10
9. 18:21
10. 84 to 16
11. 33 ounces to 11 ounces
12. 45 minutes:25 minutes
13. 77 cups:49 cups
14. 15 pounds to 39 pounds
15. 40 seconds to 60 seconds
16. 140 centimeters to 300 centimeters
17. 9 weeks: 15 weeks
18. 3 yards to 33 yards

Determine whether the ratios are equivalent. Explain.

19. \(\frac{3}{16}\) and \(\frac{9}{48}\)
20. \(\frac{7}{10}\) and \(\frac{8}{11}\)
21. 18 in.:3 ft and 12 in.:2 ft
22. 6 mos:2 yr and 8 mos:3 yr
SURVEY For Exercises 1–3, use the responses to a survey to write each ratio as a fraction in simplest form.

1. yes responses: no responses
2. no responses: not sure responses
3. not sure responses: total responses

COUNTY FAIR For Exercises 4–9, use the following information to write each ratio as a fraction in simplest form.

At its annual fair, Westborough County had 27 food booths and 63 game booths. A total of 1,350 adults and 3,600 children attended. The fair made a profit of $42,000. Of this money, $12,600 came from food sales.

4. adults:children
5. game booths:food booths
6. booths:profits

7. children:people
8. children:booths
9. non-food sale profits:profits

Determine whether the ratios are equivalent. Explain.

10. 18 trucks to 4 cars, 21 trucks to 6 cars
11. $6 for every 10 people, $9 for every 15 people
12. 33 dinners to 6 packages, 14 dinners to 4 packages

13. ENGINES A four cylinder engine produces a maximum of 110 horsepower. A six cylinder engine produces a maximum of 180 horsepower. Do these engines have an equivalent horsepower-to-cylinder ratio? Justify your answer.

ANALYZE TABLES For Exercises 14 and 15, use the information in the table that shows the crop statistics for three farms.

14. For which two farms is the soybeans-to-corn ratio the same? Explain.

15. Which farm has the highest soybeans-to-corn ratio? Justify your answer.
## Word Problem Practice

### Ratios

1. **ELECTIONS** In an election for sheriff, 210 people voted. If there were 1,260 possible voters, write a ratio to compare the number of people who voted to the number of possible voters.

2. **DENTAL CARE** Taru surveyed 60 dentists and found that 48 favored the use of fluoride toothpaste. Write a ratio to compare the number of dentists favoring the use of fluoride toothpaste to all dentists surveyed.

3. **E-MAIL** One morning, Mirna counted 15 junk e-mails out of 21 e-mails in her inbox. Write a ratio comparing the number of junk e-mails to the total number of e-mails.

4. **SURFING** One evening at his local surf spot, Jeff counted 28 surfers in the water. Among those, he counted 21 that had hoods on their wetsuits. Write a ratio comparing the number of surfers with hoods to the total number of surfers.

5. **MUSIC** A music company signed 12 new artists to its label in 2002. Out of the 12, 10 artists have hit songs. Write a ratio to compare the number of artists with hit songs to the total number of artists signed in 2002.

6. **BASEBALL** Nate had 26 hits at 50 times at bat last season. Write a ratio to compare the number of hits to the number of times at bat.

7. **BASEBALL** In baseball, David has 10 hits out of 14 at bats. Adam has 15 hits out of 21 at bats. For each player, write a ratio that represents his total number of hits out of times at bat. Are these ratios equivalent?

8. **DRIVING** Sarah can drive 198 miles on 11 gallons of gasoline. On 6 gallons of gasoline, Rachel can travel 138 miles. Write a ratio that compares miles traveled per gallon of gasoline for each car. Do the cars get the same mileage?
**Golden Ratio**

The Great Pyramid at Giza utilizes a special ratio between the altitude of a triangular face and one-half the length of the base. This ratio is known as the **Golden Ratio** and has been used repeatedly by artists and architects over the centuries. It is thought to be particularly pleasing to the human eye.

The line segment and rectangle are drawn to illustrate the relationship of the Golden Ratio. \( \frac{AB}{BC} = \frac{BC}{AC} \approx 1.618 \)

**Exercises**

Determine whether each rectangle demonstrates the Golden Ratio.

1.  
   
   ![Rectangle 1](image1)

   \[ \frac{8.09 \text{ ft}}{5 \text{ ft}} \]

2.  
   
   ![Rectangle 2](image2)

   \[ \frac{2.2 \text{ in.}}{5.76 \text{ in.}} \]

The Fibonacci Sequence, shown below, is related to the Golden Ratio.

\[ 0, 1, 1, 2, 3, 5, 8, 13, 21, \ldots \]

The ratio of a number to the previous number approximates the golden ratio. The greater the numbers in the sequence, the closer the approximation is to the golden ratio.

For Exercises 3–6, use the Golden Ratio to determine numbers in the Fibonacci Sequence. Round each number to the nearest whole number.

3. What will the next five numbers be in the sequence?
4. What will the next number be after 610?
5. What will the next number be after 2,584?
6. What will the next number be after 6,765?
Lesson Reading Guide

Rates

Get Ready for the Lesson

Do the Mini Lab at the top of page 287 in your textbook. Write your answers below.

1. Count the number of words that each of you read.

2. Write the ratio number of words to number of minutes as a fraction.

3. Simplify the fractions by dividing the numerator and the denominator by 2.

Read the Lesson

4. A rate is a special kind of ratio. What makes it special?

5. Describe what makes a rate different from a unit rate. Give an example of a rate and its equivalent unit rate.

6. Write the ratios in words for each unit rate abbreviation.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>m/s</td>
<td></td>
</tr>
<tr>
<td>ft/s</td>
<td></td>
</tr>
<tr>
<td>mi/h (mph)</td>
<td></td>
</tr>
<tr>
<td>mi/gal (mpg)</td>
<td></td>
</tr>
</tbody>
</table>

Remember What You Learned

7. Go to a food store or find several different newspaper food advertisements. Compare prices for several different sizes of the same product, or compare prices for similar sizes of different brands of the same product. Which size or which brand costs the least per unit? Report your results to the class.
Rates

A ratio that compares two quantities with different kinds of units is called a **rate**. When a rate is simplified so that it has a denominator of 1 unit, it is called a **unit rate**.

**Example 1**

**DRIVING**  
Alita drove her car 78 miles and used 3 gallons of gas. What is the car’s gas mileage in miles per gallon?

Write the rate as a fraction. Then find an equivalent rate with a denominator of 1.

\[
\frac{78 \text{ miles}}{3 \text{ gal}} = \frac{78 \div 3}{3 \text{ gal} \div 3} = \frac{26 \text{ mi}}{1 \text{ gal}}
\]

The car’s gas mileage, or unit rate, is 26 miles per gallon.

**Example 2**

**SHOPPING**  
Joe has two different sizes of boxes of cereal from which to choose. The 12-ounce box costs $2.54, and the 18-ounce box costs $3.50. Which box costs less per ounce?

Find the unit price, or the cost per ounce, of each box. Divide the price by the number of ounces.

12-ounce box: $2.54 \div 12 = $0.21 \text{ per ounce}

18-ounce box: $3.50 \div 18 \approx $0.19 \text{ per ounce}

The 18-ounce box costs less per ounce.

**Exercises**

Find each unit rate. Round to the nearest hundredth if necessary.

1. 18 people in 3 vans
2. $156 for 3 books
3. 115 miles in 2 hours
4. 8 hits in 22 games
5. 65 miles in 2.7 gallons
6. 2,500 Calories in 24 hours

Choose the best unit price.

7. $12.95 for 3 pounds of nuts or $21.45 for 5 pounds of nuts
8. A 32-ounce bottle of apple juice for $2.50 or a 48-ounce bottle for $3.84.
Skills Practice

Rates

Find each unit rate. Round to the nearest hundredth if necessary.

1. $112 in 8 hours
2. 150 miles in 6 gallons

3. 49 points in 7 games
4. 105 students in 3 classes

5. 120 problems in 5 hours
6. 3 accidents in 12 months

7. 6 eggs in 7 days
8. 8 batteries in 3 months

9. 122 patients in 4 weeks
10. 51 gallons in 14 minutes

11. $8.43 for 3 pounds
12. 357 miles in 6.3 hours

13. 25 letters in 4 days
14. $99 for 12 CDs

15. 5 breaks in 8 hours
16. 3 trips in 14 months

17. 2 pay raises in 3 years
18. 7 errors in 60 minutes

19. 15 pounds in 6 weeks
20. 8 commercials in 15 minutes

21. 8 glasses every 24 hours
22. 13 feet in 5 steps

Choose the best unit price.

23. $4.99 for 6 cans or $7.99 for 10 cans

24. $21.50 for 4 pounds of lunch meat or $15.10 for 3 pounds of lunch meat
Practice

Rates

Find each unit rate. Round to the nearest hundredth if necessary.

1. $11.49 for 3 packages
2. 2,550 gallons in 30 days
3. 88 students for 4 classes
4. 15.6 °F in 13 minutes
5. 175 Calories in 12 ounces
6. 258.5 miles in 5.5 hours
7. 549 vehicles on 9 acres
8. $920 for 40 hours
9. 13 apples for 2 pies

10. SPORTS The results of a track meet are shown. Who ran the fastest? Explain your reasoning. Round to the nearest ten thousandth.

<table>
<thead>
<tr>
<th>Name</th>
<th>Event</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theo</td>
<td>3K Run</td>
<td>9.6</td>
</tr>
<tr>
<td>Esteban</td>
<td>5K Run</td>
<td>13.5</td>
</tr>
<tr>
<td>Tetsuo</td>
<td>10K Run</td>
<td>31.9</td>
</tr>
</tbody>
</table>

11. MANUFACTURING A machinist can produce 114 parts in 6 minutes. At this rate, how many parts can the machinist produce in 15 minutes?

12. RECIPES A recipe that makes 8 jumbo blueberry muffins calls for $1 \frac{1}{2}$ teaspoons of baking powder. How much baking powder is needed to make 3 dozen jumbo muffins?

Estimate the unit price for each item. Justify your answers.

13. $299 for 4 tires
14. 3 yards of fabric for $13.47

UTILITIES For Exercises 15 and 16, use the table that shows the average monthly electricity and water usage.

<table>
<thead>
<tr>
<th>Family Name</th>
<th>Family Size</th>
<th>Electricity (kilowatt-hours)</th>
<th>Water (gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melendez</td>
<td>4</td>
<td>1,500</td>
<td>3,500</td>
</tr>
<tr>
<td>Barton</td>
<td>6</td>
<td>2,100</td>
<td>6,400</td>
</tr>
<tr>
<td>Stiles</td>
<td>2</td>
<td>1,400</td>
<td>2,500</td>
</tr>
</tbody>
</table>

15. Which family uses about twice the amount of electricity per person than the other two families? Explain your reasoning.

16. Which family uses the least amount of water per person? Explain your reasoning.
<table>
<thead>
<tr>
<th></th>
<th>Word Problem Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rates</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1. TRAVEL</strong> During Sonia’s trip across the country, she traveled 2,884 miles. Her trip took 7 days. Find a unit rate to represent the average miles she traveled per day during the trip.</td>
<td><strong>2. BUDGET</strong> Steve was offered $5,025 per year for a weekend lifeguarding job at a local pool. He wants to know how much his monthly income will be at this salary level. What is his rate of pay in dollars per month?</td>
</tr>
<tr>
<td><strong>3. MUSIC</strong> Randall recorded 8 songs on his most recent CD. The total length of the CD is 49 minutes. Find a unit rate to represent the average length per song on the CD.</td>
<td><strong>4. CARPETING</strong> Hana paid $1,200 for the carpet in her living room. The room has an area of 251.2 square feet. What was her unit cost of carpeting in dollars per square foot? Round to the nearest cent.</td>
</tr>
<tr>
<td><strong>5. SHOPPING</strong> An 8-ounce can of tomatoes costs $1.14. A 12-ounce can costs $1.75. Which can of tomatoes has the better unit price?</td>
<td><strong>6. PETS</strong> Last month, Hao’s dog ate 40 cans of dog food in 31 days. How many cans should Hao buy to feed his dog for the next 6 days?</td>
</tr>
</tbody>
</table>
An Educated Consumer

Choosing a checking account is something that most people do at some point in their lives. Because checking accounts vary from institution to institution, and from one type of account to another, you will need to consider the options associated with each account before choosing one of them.

Suppose a bank offers two kinds of checking accounts.

**Account A:** a $0.20 charge for writing each check and no service charge

**Account B:** a $0.10 charge for writing each check and a monthly service charge of $1.50

1. Which account would cost less if a person were to write 10 checks in a month?

2. Which account would cost less if a person were to write 20 checks in a month?

3. Using the guess-and-check strategy, find the number of checks that would have to be written for the cost of Account A to equal the cost of Account B. What is that cost?

4. Which account would cost less if a person were to write 250 checks in a year? By how much?

5. Diana Durbin wrote 300 checks in one year. Her total charge for the use of the account that year was $72.00. The bank charges $0.15 for writing one check and charges a fixed amount each month for the use of the account. What is that monthly service charge?
Lesson Reading Guide

Measurement: Changing Customary Units

Get Ready for the Lesson

Read the introduction at the top of page 294 in your textbook. Write your answers below.

1. Complete the ratio table. The first two ratios are done for you.

<table>
<thead>
<tr>
<th>Tons</th>
<th>1</th>
<th>4</th>
<th>5</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pounds</td>
<td>2,000</td>
<td>8,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Then graph the ordered pairs (tons, pounds) from the table. Label the horizontal axis Weight in Tons and the vertical axis Weight in Pounds. Connect the points. What do you notice about the graph of these data?

Read the Lesson

3. To the right of each customary unit write its abbreviation.

- inch
- foot
- yard
- mile
- ton
- ounce
- pound
- pint
- cup
- gallon

Complete each sentence.

4. To convert from larger units to smaller units, ________.

5. To convert from smaller units to larger units, ________.

Remember What You Learned

6. Complete the table.

<table>
<thead>
<tr>
<th>Customary Units of Length</th>
<th>Customary Units of Weight</th>
<th>Customary Units of Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 foot = ______ inches</td>
<td>1 pound = ______ ounces</td>
<td>1 cup = ______ fluid ounces</td>
</tr>
<tr>
<td>1 yard = ______ feet</td>
<td>1 ton = ______ pounds</td>
<td>1 pint = ______ cups</td>
</tr>
<tr>
<td>1 mile = ______ feet</td>
<td>1 gallon = ______ quarts</td>
<td>1 quart = ______ pints</td>
</tr>
</tbody>
</table>
Exercises

Example 1 \(5\frac{1}{2} \text{ lb} = \_\_\_ \text{ oz}\)

To change from larger units to smaller units, multiply.

\[5\frac{1}{2} \times 16 = 88\]
Since 1 pound is 16 ounces, multiply by 16.

\[5\frac{1}{2} \text{ pounds} = 88 \text{ ounces}\]

Example 2 \(28 \text{ fl oz} = \_\_\_ \text{ c}\)

To change from smaller units to larger units, divide.

\[28 \div 8 = 3\frac{1}{2}\]
Since 8 fluid ounces are in 1 cup, divide by 8.

\[28 \text{ fluid ounces} = 3\frac{1}{2} \text{ cups}\]

Exercises

Complete.

1. \(5 \text{ lb} = \_\_\_ \text{ oz}\)
2. \(48 \text{ in.} = \_\_\_ \text{ ft}\)
3. \(6 \text{ yd} = \_\_\_ \text{ ft}\)

4. \(7 \text{ qt} = \_\_\_ \text{ pt}\)
5. \(8,000 \text{ lb} = \_\_\_ \text{ T}\)
6. \(3\frac{1}{4} \text{ mi} = \_\_\_ \text{ ft}\)

7. \(4 \text{ c} = \_\_\_ \text{ fl oz}\)
8. \(6 \text{ c} = \_\_\_ \text{ pt}\)
9. \(\frac{1}{2} \text{ gal} = \_\_\_ \text{ qt}\)

10. \(3 \text{ ft} = \_\_\_ \text{ in.}\)
11. \(9 \text{ qt} = \_\_\_ \text{ gal}\)
12. \(30 \text{ fl oz} = \_\_\_ \text{ c}\)

13. \(6,864 \text{ ft} = \_\_\_ \text{ mi}\)
14. \(40 \text{ oz} = \_\_\_ \text{ lb}\)
15. \(9 \text{ pt} = \_\_\_ \text{ c}\)

16. \(18 \text{ ft} = \_\_\_ \text{ yd}\)
17. \(11 \text{ pt} = \_\_\_ \text{ qt}\)
18. \(2\frac{3}{4} \text{ T} = \_\_\_ \text{ lb}\)
### Skills Practice
**Measurement: Changing Customary Units**

Complete.

1. $3 \text{ lb} = \underline{} \text{ oz}$
2. $16 \text{ qt} = \underline{} \text{ gal}$

3. $24 \text{ in.} = \underline{} \text{ ft}$
4. $12 \text{ ft} = \underline{} \text{ yd}$

5. $3 \text{ mi} = \underline{} \text{ ft}$
6. $12,000 \text{ lb} = \underline{} \text{ T}$

7. $64 \text{ oz} = \underline{} \text{ lb}$
8. $6 \text{ pt} = \underline{} \text{ qt}$

9. $3 \text{ pt} = \underline{} \text{ c}$
10. $5\frac{1}{2} \text{ ft} = \underline{} \text{ in.}$

11. $22 \text{ yd} = \underline{} \text{ ft}$
12. $\frac{1}{4} \text{ mi} = \underline{} \text{ ft}$

13. $15 \text{ T} = \underline{} \text{ lb}$
14. $7 \text{ lb} = \underline{} \text{ oz}$

15. $8\frac{1}{2} \text{ qt} = \underline{} \text{ pt}$
16. $5 \text{ gal} = \underline{} \text{ qt}$

17. $8 \text{ c} = \underline{} \text{ pt}$
18. $16 \text{ in} = \underline{} \text{ ft}$

19. $24 \text{ fl oz} = \underline{} \text{ c}$
20. $60 \text{ ft} = \underline{} \text{ yd}$

21. $6,600 \text{ ft} = \underline{} \text{ mi}$
22. $7.5 \text{ T} = \underline{} \text{ lb}$

23. $88 \text{ oz} = \underline{} \text{ lb}$
24. $70 \text{ qt} = \underline{} \text{ gal}$
Complete.

1. \(4 \text{ c} = \underline{\quad} \text{ fl oz}\)
2. \(5 \text{ c} = \underline{\quad} \text{ pt}\)
3. \(3 \text{ lb} = \underline{\quad} \text{ oz}\)
4. \(24 \text{ ft} = \underline{\quad} \text{ yd}\)
5. \(1\frac{1}{2} \text{ pt} = \underline{\quad} \text{ c}\)
6. \(64 \text{ oz} = \underline{\quad} \text{ lb}\)
7. \(4 \text{ mi} = \underline{\quad} \text{ ft}\)
8. \(2\frac{3}{4} \text{ mi} = \underline{\quad} \text{ ft}\)
9. \(3,000 \text{ lb} = \underline{\quad} \text{T}\)
10. \(5 \text{ gal} = \underline{\quad} \text{ qt}\)
11. \(3\frac{1}{4} \text{ qt} = \underline{\quad} \text{ pt}\)
12. \(4\frac{5}{8} \text{T} = \underline{\quad} \text{ lb}\)
13. \(3\frac{1}{2} \text{ gal} = \underline{\quad} \text{ qt}\)
14. \(7 \text{ c} = \underline{\quad} \text{ qt}\)
15. \(40 \text{ fl oz} = \underline{\quad} \text{ qt}\)
16. \(660 \text{ yd} = \underline{\quad} \text{ mi}\)
17. \(1.9 \text{ yd} = \underline{\quad} \text{ in.}\)
18. \(2\frac{1}{4} \text{T} = \underline{\quad} \text{ oz}\)

19. **SPORTS** The track surrounding a football field is \(\frac{1}{4}\) mile long. How many yards long is the track?

20. **STRAWBERRIES** One quart of strawberries weighs about 2 pounds. About how many quarts of strawberries would weigh \(\frac{1}{4}\) ton?

**ANALYZE GRAPHS** For Exercises 21–23, use the graph shown.

21. What does an ordered pair from this graph represent?

22. Write two sentences that describe the graph.

23. Use the graph to find the length in inches of a 1.5 foot iguana. Explain your reasoning.
## Word Problem Practice

### Measurement: Changing Customary Units

<table>
<thead>
<tr>
<th><strong>1. WEIGHT</strong> The average weight of a baby at birth is 7 pounds. How many ounces is this?</th>
<th><strong>2. WATERFALLS</strong> The height of Niagara Falls is 182 feet. How many yards high is it?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3. GASOLINE</strong> The gasoline tank of a minivan holds 18 gallons. How many quarts is this?</td>
<td><strong>4. TELEPHONES</strong> Portable telephones can weigh as little as 8 ounces. How many pounds is this?</td>
</tr>
<tr>
<td><strong>5. RECIPE</strong> A recipe for ice cream calls for 56 fluid ounces of milk. How many cups of milk is this?</td>
<td><strong>6. STATUE</strong> The Statue of Liberty weighs 450,000 pounds. How many tons is this?</td>
</tr>
<tr>
<td><strong>7. TUNNEL</strong> The Ted Williams Tunnel under Boston Harbor is 8,448 feet long. How many yards is this?</td>
<td><strong>8. COAL</strong> The United States exports over 200 billion pounds of coal. How many tons is this?</td>
</tr>
</tbody>
</table>
Changing Measurements with Factors of 1

Multiplying an expression by the number 1 does not change its value. This property of multiplication can be used to change measurements.

Let’s say you wanted to change 4.5 hours to seconds. Start by multiplying 4.5 by the number 1 written in the form \(\frac{60 \text{ minutes}}{1 \text{ hour}}\). This first step changes 4.5 hours to minutes.

\[
4.5 \text{ hours} \times \frac{60 \text{ minutes}}{1 \text{ hour}}
\]

Now, multiply by the number 1 again. This time use the fact that \(1 = \frac{60 \text{ seconds}}{1 \text{ minute}}\).

\[
4.5 \text{ hours} \times \frac{60 \text{ minutes}}{1 \text{ hour}} \times \frac{60 \text{ seconds}}{1 \text{ minute}} = 16,200 \text{ seconds}
\]

Complete by writing the last factor and the answer. You may need to use a table of measurements to find the factors.

1. Change 5 pints to fluid ounces.
   \[
   5 \text{ pints} \times \frac{2 \text{ cups}}{1 \text{ pint}} \times
   \]

2. Change 0.8 miles to inches.
   \[
   0.8 \text{ mile} \times \frac{5,280 \text{ feet}}{1 \text{ mile}} \times
   \]

3. Change 4 square yards to square inches.
   \[
   4 \text{ yd}^2 \times \frac{9 \text{ ft}^2}{1 \text{ yd}^2} \times
   \]

4. Change 12 bushels to pints.
   \[
   12 \text{ bushels} \times \frac{4 \text{ pecks}}{1 \text{ bushel}} \times \frac{8 \text{ quarts}}{1 \text{ peck}} \times
   \]

5. Change one-half of an acre to square inches.
   \[
   \frac{1}{2} \text{ acre} \times \frac{4,840 \text{ yd}^2}{1 \text{ acre}} \times \frac{9 \text{ ft}^2}{1 \text{ yd}^2} \times
   \]
Get Ready for the Lesson

Complete the Mini Lab at the top of page 300 in your textbook.
Write your answers below.

1. Select three other objects. Find and record the width of all five objects to the nearest millimeter and tenth of a centimeter.

2. Compare the measurements of the objects, and write a rule that describes how to convert from millimeters to centimeters.

3. Measure the length of your classroom in meters. Make a conjecture about how to convert this measure to centimeters. Explain.

Read the Lesson

Complete each sentence.

4. To convert from centimeters to kilometers, first divide by ________ to convert to meters, then divide by ________ to convert to kilometers.

5. To convert from kiloliters to milliliters, first multiply by ________ to convert to liters, then multiply by ________ to convert to milliliters.

6. To convert from ________ to centigrams, multiply by 100.

Remember What You Learned

7. Name an everyday object that you can associate with each base metric unit of measure to help you remember what each unit represents.
   kilogram:
   meter:
   liter:
The table below is a summary of how to convert measures in the metric system.

<table>
<thead>
<tr>
<th>Units of Length (meter)</th>
<th>Larger Units → Smaller Units</th>
<th>Smaller Units → Larger Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>km to m</td>
<td>multiply by 1,000</td>
<td>mm to cm – divide by 10</td>
</tr>
<tr>
<td>m to cm</td>
<td>multiply by 100</td>
<td>mm to m – divide by 1,000</td>
</tr>
<tr>
<td>m to mm</td>
<td>multiply by 1,000</td>
<td>cm to m – divide by 100</td>
</tr>
<tr>
<td>cm to mm</td>
<td>multiply by 10</td>
<td>m to km – divide by 1,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Units of Mass (kilogram)</th>
<th>Larger Units → Smaller Units</th>
<th>Smaller Units → Larger Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg to g</td>
<td>multiply by 1,000</td>
<td>mg to g – divide by 1,000</td>
</tr>
<tr>
<td>g to mg</td>
<td>multiply by 1,000</td>
<td>g to kg – divide by 1,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Units of Capacity (liter)</th>
<th>Larger Units → Smaller Units</th>
<th>Smaller Units → Larger Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>kL to L</td>
<td>multiply by 1,000</td>
<td>mL to L – divide by 1,000</td>
</tr>
<tr>
<td>L to mL</td>
<td>multiply by 1,000</td>
<td>L to kL – divide by 1,000</td>
</tr>
</tbody>
</table>

**Examples 1** Complete. 62 cm = ____ m

To convert from centimeters to meters, divide by 100.
62 ÷ 100 = 0.62
62 cm = 0.62 m

**Example 2** Complete. 2.6 kL = ____ L

To convert from kiloliters to liters, multiply by 1,000.
2.6 × 1,000 = 2,600
2.6 kL = 2,600 L

**Exercises**

Complete.

1. 650 cm = ____ m
2. 57 kg = ____ g
3. 751 mg = ____ g
4. 8.2 L = ____ mL
5. 52 L = ____ kL
6. 892 mm = ____ m
7. 121.4 kL = ____ L
8. 0.72 cm = ____ mm
9. 67.3 g = ____ kg
10. 5.2 g = ____ mg
11. 0.05 m = ____ mm
12. 2,500 mg = ____ g
13. 32 mm = ____ cm
14. 96 m = ____ cm
Skills Practice

Measurement: The Metric System

Complete.

1. \(660 \text{ m} = \boxed{0.66} \text{ km}\)  
2. \(5.7 \text{ m} = \boxed{570} \text{ cm}\)

3. \(543 \text{ mL} = \boxed{0.543} \text{ L}\)  
4. \(23.7 \text{ g} = \boxed{23700} \text{ mg}\)

5. \(529 \text{ mg} = \boxed{0.529} \text{ g}\)  
6. \(2,640 \text{ mL} = \boxed{2.64} \text{ L}\)

7. \(4.32 \text{ kL} = \boxed{4320} \text{ L}\)  
8. \(75.4 \text{ mg} = \boxed{0.0754} \text{ g}\)

9. \(8,300 \text{ mg} = \boxed{8.3} \text{ g}\)  
10. \(7.3 \text{ m} = \boxed{730} \text{ cm}\)

11. \(250.3 \text{ kL} = \boxed{250300} \text{ L}\)  
12. \(799 \text{ g} = \boxed{0.799} \text{ kg}\)

13. \(8.5 \text{ cm} = \boxed{85} \text{ mm}\)  
14. \(450 \text{ kg} = \boxed{450000} \text{ g}\)

15. \(7.3 \text{ L} = \boxed{7300} \text{ mL}\)  
16. \(6,140 \text{ L} = \boxed{6.14} \text{ kL}\)

17. \(3,500 \text{ m} = \boxed{3.5} \text{ km}\)  
18. \(89 \text{ km} = \boxed{89000} \text{ m}\)

19. \(26.8 \text{ mm} = \boxed{2.68} \text{ cm}\)  
20. \(750 \text{ m} = \boxed{0.75} \text{ km}\)

21. \(4.8 \text{ m} = \boxed{480} \text{ cm}\)  
22. \(95 \text{ g} = \boxed{0.095} \text{ kg}\)

23. \(389 \text{ mm} = \boxed{0.389} \text{ m}\)  
24. \(56 \text{ L} = \boxed{0.056} \text{ kL}\)

25. \(0.32 \text{ mm} = \boxed{0.0032} \text{ cm}\)  
26. \(39.1 \text{ g} = \boxed{0.0391} \text{ kg}\)
6-4 Practice

Measurement: The Metric System

Complete.
1. \(570 \text{ cm} = \ ? \text{ m}\)
2. \(356 \text{ mm} = \ ? \text{ m}\)
3. \(4.7 \text{ m} = \ ? \text{ cm}\)
4. \(0.4 \text{ m} = \ ? \text{ mm}\)
5. \(0.63 \text{ cm} = \ ? \text{ mm}\)
6. \(0.18 \text{ mm} = \ ? \text{ cm}\)
7. \(0.42 \text{ km} = \ ? \text{ m}\)
8. \(0.09 \text{ km} = \ ? \text{ mm}\)
9. \(0.13 \text{ km} = \ ? \text{ cm}\)
10. \(27 \text{ kg} = \ ? \text{ g}\)
11. \(8.3 \text{ g} = \ ? \text{ mg}\)
12. \(257 \text{ mg} = \ ? \text{ g}\)
13. \(486 \text{ g} = \ ? \text{ kg}\)
14. \(55.5 \text{ g} = \ ? \text{ kg}\)
15. \(68,700 \text{ mg} = \ ? \text{ kg}\)
16. \(308 \text{ mL} = \ ? \text{ L}\)
17. \(1.7 \text{ L} = \ ? \text{ mL}\)
18. \(88 \text{ L} = \ ? \text{ kL}\)
19. \(0.059 \text{ kL} = \ ? \text{ L}\)
20. \(64,000 \text{ mL} = \ ? \text{ L}\)
21. \(30,000 \text{ mL} = \ ? \text{ kL}\)

Order each set of measures from least to greatest.
22. \(0.06 \text{ km}, 47 \text{ m}, 15,800 \text{ cm}\)
23. \(891 \text{ g}, 7,800 \text{ mg}, 0.5 \text{ kg}\)

24. SPELUNKING  The survey length of an underground cave is 0.914 kilometers. How many meters in length is this cave?

25. FOOD  A 15-ounce box of granola contains 0.425 kilograms of cereal. How many grams of cereal are in the box of granola?
### Word Problem Practice

**Measurement: The Metric System**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. RUNNING</strong></td>
<td>Each morning Carlos runs 1.5 kilometers. How many meters did he run?</td>
</tr>
<tr>
<td><strong>2. AVIATION</strong></td>
<td>A helicopter was flying 800 meters above the ground. How many kilometers above the ground was it flying?</td>
</tr>
<tr>
<td><strong>3. SODA</strong></td>
<td>A soda can contains 355 milliliters of liquid. How many liters of liquid does it contain?</td>
</tr>
<tr>
<td><strong>4. CONSTRUCTION</strong></td>
<td>The ceilings of most classrooms are about 2.5 meters above the floor. How many centimeters high is the ceiling?</td>
</tr>
<tr>
<td><strong>5. FENCING</strong></td>
<td>Gerri’s garden is 1,270 centimeters around the edges. How many meters of fencing material does she need to enclose her garden?</td>
</tr>
<tr>
<td><strong>6. GARDENING</strong></td>
<td>Mr. Chou’s lawn sprinkler sprays about 150 liters of water each hour. How many kiloliters of water does it spray?</td>
</tr>
<tr>
<td><strong>7. NUTRITION</strong></td>
<td>For 11- to 14-year-olds, the Recommended Dietary Allowance (RDA) for protein is about 60 grams daily. How many milligrams do they need daily?</td>
</tr>
<tr>
<td><strong>8. MEASUREMENT</strong></td>
<td>A measure of one pound is equivalent to about 454 grams. How many kilograms are in one pound? How many milligrams?</td>
</tr>
</tbody>
</table>
Using a Measurement Conversion Chart

You may sometimes want to convert customary measurements to metric measurements. For example, suppose you are reading about horses and want to know how long 5 furlongs are.

Start by finding a conversion table such as the one shown here. (Dictionaries often include such tables.)

<table>
<thead>
<tr>
<th>Customary Unit</th>
<th>Metric Unit 1</th>
<th>Metric Unit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mil</td>
<td>0.001 inch</td>
<td>0.0254 millimeter</td>
</tr>
<tr>
<td>1 inch</td>
<td>1,000 mil</td>
<td>2.54 centimeters</td>
</tr>
<tr>
<td>12 inches</td>
<td>1 foot</td>
<td>0.3048 meter</td>
</tr>
<tr>
<td>3 feet</td>
<td>1 yard</td>
<td>0.9144 meter</td>
</tr>
<tr>
<td>5½ yards</td>
<td>1 rod</td>
<td>5.029 meters</td>
</tr>
<tr>
<td>40 rods</td>
<td>1 furlong</td>
<td>201.168 meters</td>
</tr>
<tr>
<td>8 furlongs</td>
<td>1 (statute) mile</td>
<td>1.6093 kilometers</td>
</tr>
<tr>
<td>5,280 feet</td>
<td>1,760 yards</td>
<td>1 rod</td>
</tr>
<tr>
<td>1 (land) league</td>
<td></td>
<td>1 mile</td>
</tr>
</tbody>
</table>

To change from a large unit to a small unit, multiply. To change from a small unit to a large one, divide.

**Example 1**  
Change 5 furlongs to meters.

\[ 5 \times 201.168 = 1,005.84 \]

So, 5 furlongs is about 1,000 meters, or 1 kilometer.

Change each measurement to a metric measurement. Round each answer to the nearest tenth.

1. 10 yards  
2. 100 leagues  
3. 10 inches  
4. 100 rods  
5. 1,000 mils  
6. 10 feet  
7. 50 miles  
8. 50 furlongs  
9. 50 inches  
10. 200 feet  
11. 200 miles  
12. 200 yards
Lesson Reading Guide

Algebra: Solving Proportions

Get Ready for the Lesson
Read the introduction at the top of page 306 in your textbook. Write your answers below.

1. Write the rate \( \frac{\text{vitamin C}}{\text{serving size}} \) for each serving size of cereal.

2. Find the number of milligrams per cup for each serving size.

Read the Lesson

3. What symbol tells you that two ratios are equivalent?

4. What is true about the cross products of a proportion?

5. How are cross products useful in identifying a proportion?

6. How are cross products useful in solving a proportion?

Remember What You Learned

7. Explain what it means to solve a proportion. Use an example to show what you mean.
A proportion is an equation stating that two ratios are equivalent. Since rates are types of ratios, they can also form proportions. In a proportion, a cross product is the product of the numerator of one ratio and the denominator of the other ratio.

**Example 1**
Determine whether \( \frac{2}{3} \) and \( \frac{10}{15} \) form a proportion.

\[
\frac{2}{3} = \frac{10}{15}
\]

Write a proportion.

\[
2 \times 15 = 3 \times 10
\]

Find the cross products.

\[
30 = 30 \quad \checkmark
\]

Multiply.

The cross products are equal, so the ratios form a proportion.

**Example 2**
Solve \( \frac{8}{a} = \frac{10}{15} \).

\[
\frac{8}{a} = \frac{10}{15}
\]

Write the proportion.

\[
8 \times 15 = a \times 10
\]

Find the cross products.

\[
120 = 10a
\]

Multiply.

\[
\frac{120}{10} = \frac{10a}{10}
\]

Divide each side by 10.

\[
12 = a
\]

Simplify.

The solution is 12.

**Exercises**

Determine if the quantities in each pair of ratios are proportional. Explain.

1. \( \frac{8}{10} = \frac{4}{5} \)
2. \( \frac{9}{4} = \frac{11}{6} \)
3. \( \frac{6}{14} = \frac{9}{21} \)
4. \( \frac{15}{12} = \frac{9}{6} \)
5. \( \frac{\$2.48}{4 \text{ oz}} = \frac{\$3.72}{6 \text{ oz}} \)
6. \( \frac{125 \text{ mi}}{5.7 \text{ gal}} = \frac{120 \text{ mi}}{5.6 \text{ gal}} \)

Solve each proportion.

7. \( \frac{y}{17} = \frac{16}{28} \)
8. \( \frac{5}{15} = \frac{15}{w} \)
9. \( \frac{20}{b} = \frac{70}{28} \)
10. \( \frac{52}{8} = \frac{m}{9} \)
Skills Practice

Algebra: Solving Proportions

Determine if the quantities in each pair of ratios are proportional.

1. \( \frac{9}{5} = \frac{27}{15} \)
2. \( \frac{16}{10} = \frac{24}{15} \)
3. \( \frac{6}{18} = \frac{9}{25} \)
4. \( \frac{42}{63} = \frac{28}{42} \)
5. \( \frac{11}{8} = \frac{13}{10} \)
6. \( \frac{22}{33} = \frac{12}{18} \)
7. \( \frac{14}{17} = \frac{29}{35} \)
8. \( \frac{36}{22} = \frac{30}{19} \)
9. \( \frac{32}{48} = \frac{10}{15} \)
10. \( \frac{320 \text{ mi}}{6 \text{ h}} = \frac{420 \text{ mi}}{8 \text{ h}} \)
11. \( \frac{\$4.96}{8 \text{ oz}} = \frac{\$3.72}{6 \text{ oz}} \)
12. \( \frac{25 \text{ mg}}{1.5 \text{ c}} = \frac{100 \text{ mg}}{6 \text{ c}} \)

Solve each proportion.

13. \( \frac{24}{13} = \frac{a}{26} \)
14. \( \frac{18}{x} = \frac{3}{36} \)
15. \( \frac{3}{u} = \frac{5}{15} \)
16. \( \frac{650}{6.5} = \frac{z}{5} \)
17. \( \frac{2.8}{4} = \frac{7}{q} \)
18. \( \frac{c}{17} = \frac{0.01}{8.5} \)
19. \( \frac{0.1}{8.2} = \frac{1.8}{b} \)
20. \( \frac{300}{24} = \frac{18}{j} \)
21. \( \frac{4.2}{t} = \frac{8}{5} \)
22. \( \frac{120}{75} = \frac{8}{m} \)
6-5

Algebra: Solving Proportions

Determine if the quantities in each pair of ratios are proportional. Explain your reasoning.

1. 5 pounds of grass seed for 350 square feet and 8 pounds of grass seed for 560 square feet

2. 34 students from 8 schools and 25 students from 6 schools

Solve each proportion.

3. \( \frac{5}{6} = \frac{a}{36} \)

4. \( \frac{k}{8} = \frac{8}{16} \)

5. \( \frac{7}{c} = \frac{14}{38} \)

6. \( \frac{4}{9} = \frac{40}{x} \)

7. \( \frac{12}{d} = \frac{5}{7} \)

8. \( \frac{6}{m} = \frac{42}{7} \)

9. \( \frac{n}{3.2} = \frac{3}{8} \)

10. \( \frac{2.8}{7.7} = \frac{z}{4.4} \)

11. \( \frac{1.5}{3.5} = \frac{4.5}{y} \)

12. **CONDIMENTS** A store sells a 9-ounce jar of mustard for $1.53 and a 15-ounce jar for $2.55. Is the cost of the mustard proportional to the number of ounces for each jar? Explain your reasoning.

13. **SCIENCE** There are 113.2 grams in 4 ounces of compound. How many grams are in 5 ounces of compound?

14. **FURNITURE** A furniture company has 15 trucks that make about 120 deliveries each day. The company is expanding and expects an additional 40 deliveries each day. Write and solve a proportion to find how many more trucks are needed so the truck-to-delivery ratio remains the same.

15. **CHARITY** Karthik spent $35 of his allowance and gave $5 to a charity. If the number of dollars he spends is proportional to the number of dollars he gives to a charity, how much of a $100-allowance will he give to a charity?
### Word Problem Practice

#### Algebra: Solving Proportions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. COOKING</strong> Theo wants to use a cookie recipe that makes 36 cookies but he wants to reduce the number of cookies to 24. If the recipe specifies using 2 cups of sugar, how much sugar should he use?</td>
<td><strong>2. MEDICINE</strong> In order to determine her pulse rate, June’s nurse counted 18 beats in her pulse in 15 seconds. At this rate, how many beats would she have in 60 seconds?</td>
</tr>
<tr>
<td><strong>3. LABOR</strong> Ed earned $112 for 8 hours of work. At this rate, how much will he earn for 40 hours of work?</td>
<td><strong>4. TRAVEL</strong> Rita traveled 1,250 miles in the first 3 days of her trip. At this rate, how long will it take her to travel 1,875 miles?</td>
</tr>
<tr>
<td><strong>5. MODELS</strong> An architect built a model of a 220-foot tall building he is designing. The model is 25 inches tall and 10 inches wide. How wide is the actual building?</td>
<td><strong>6. TESTING</strong> Mary is preparing for her college entrance exams. In a practice test, she answered 12 problems in 30 minutes. At this rate, how many questions can she expect to answer in 150 minutes?</td>
</tr>
</tbody>
</table>
What Am I?

Solve each proportion. Then, starting at the box marked with the heavy outline, draw an arrow to the adjacent box containing the variable with the least value. (You may move horizontally or vertically. You may use each box at most once.)

Now fill in the table below with the letters in the order in which you found them. Now you can say what I am.

<table>
<thead>
<tr>
<th>Proportion</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{3.5}{1} = \frac{o}{2}$</td>
<td>$o = 7$</td>
</tr>
<tr>
<td>$\frac{n}{37} = \frac{54}{55}$</td>
<td>$n = 54$</td>
</tr>
<tr>
<td>$\frac{5}{e} = \frac{2\frac{1}{2}}{21}$</td>
<td>$e = 10$</td>
</tr>
<tr>
<td>$\frac{16.5}{36} = \frac{11}{a}$</td>
<td>$a = 22$</td>
</tr>
<tr>
<td>$\frac{z}{2} = \frac{4}{1}$</td>
<td>$z = 8$</td>
</tr>
<tr>
<td>$\frac{0.7}{h} = \frac{2.1}{108}$</td>
<td>$h = 36$</td>
</tr>
<tr>
<td>$\frac{0.3}{0.4} = \frac{18}{o}$</td>
<td>$o = 24$</td>
</tr>
<tr>
<td>$\frac{3}{5.82} = \frac{n}{48.5}$</td>
<td>$n = 48.5$</td>
</tr>
<tr>
<td>$\frac{p}{55} = \frac{2\frac{1}{2}}{1}$</td>
<td>$p = 110$</td>
</tr>
<tr>
<td>$\frac{a}{5} = \frac{9}{15}$</td>
<td>$a = 15$</td>
</tr>
<tr>
<td>$\frac{2}{7} = \frac{p}{14}$</td>
<td>$p = 4$</td>
</tr>
<tr>
<td>$\frac{0.5}{i} = \frac{24}{384}$</td>
<td>$i = 60$</td>
</tr>
<tr>
<td>$\frac{z}{32} = \frac{7}{8}$</td>
<td>$z = 56$</td>
</tr>
<tr>
<td>$\frac{43.2}{18} = \frac{u}{5}$</td>
<td>$u = 120$</td>
</tr>
<tr>
<td>$\frac{4}{o} = \frac{20}{30}$</td>
<td>$o = 30$</td>
</tr>
<tr>
<td>$\frac{3.4}{6.8} = \frac{2.5}{r}$</td>
<td>$r = 5$</td>
</tr>
<tr>
<td>$\frac{2}{9} = \frac{t}{18}$</td>
<td>$t = 4$</td>
</tr>
<tr>
<td>$\frac{1}{3} = \frac{2}{60}$</td>
<td>$z = 20$</td>
</tr>
<tr>
<td>$\frac{72}{12} = \frac{t}{14}$</td>
<td>$t = 8$</td>
</tr>
<tr>
<td>$\frac{p}{\frac{1}{2}} = \frac{16}{2}$</td>
<td>$p = 32$</td>
</tr>
<tr>
<td>$\frac{a}{24} = \frac{10.5}{36}$</td>
<td>$a = 10$</td>
</tr>
<tr>
<td>$\frac{3.5}{5.5} = \frac{7}{r}$</td>
<td>$r = 12.5$</td>
</tr>
<tr>
<td>$\frac{2\frac{1}{2}}{9} = \frac{5}{l}$</td>
<td>$l = 10$</td>
</tr>
<tr>
<td>$\frac{e}{\frac{1}{5}} = \frac{12.5}{12}$</td>
<td>$e = 62.5$</td>
</tr>
<tr>
<td>$\frac{600}{150} = \frac{o}{3.5}$</td>
<td>$o = 21$</td>
</tr>
<tr>
<td>$\frac{1\frac{2}{5}}{1.4} = \frac{r}{20}$</td>
<td>$r = 5$</td>
</tr>
<tr>
<td>$\frac{0.2}{o} = \frac{0.5}{35}$</td>
<td>$o = 22.5$</td>
</tr>
<tr>
<td>$\frac{3}{8} = \frac{6}{d}$</td>
<td>$d = 16$</td>
</tr>
<tr>
<td>$\frac{1\frac{4}{5}}{i} = \frac{3}{96}$</td>
<td>$i = 3$</td>
</tr>
</tbody>
</table>
A graphing calculator can be used to solve proportions. On the TI-83/84 Plus, you can use the equation solver to solve proportions. To do this, you need to first set the equation equal to zero.

**Example** Solve \( \frac{x}{3} = \frac{8}{12} \).

First, subtract \( \frac{8}{12} \) from each side to set the equation equal to zero.

So, the new equation is \( \frac{x}{3} - \frac{8}{12} = 0 \).

Now use the TI-83 Plus Equation Solver to solve for \( x \).

Enter:

\[
\begin{align*}
\text{MATH} & \quad 0 \quad \boxed{\Delta} \quad \text{X,T,\theta,n} \quad \div & \quad 3 \quad \boxed{\div} \quad 8 \quad \boxed{\div} \quad 12 \\
\text{ENTER} \quad \text{ALPHA} \quad \text{[SOLVE]} 
\end{align*}
\]

So, \( x = 2 \).

**Exercises**

Solve each proportion.

1. \( \frac{x}{5} = \frac{15}{10} \)
2. \( \frac{x}{2} = \frac{30}{20} \)
3. \( \frac{x}{6} = \frac{20}{24} \)
4. \( \frac{2x}{3} = \frac{8}{25} \)
5. \( \frac{x}{6} = \frac{15}{12} \)
6. \( \frac{3x}{4} = \frac{18}{12} \)
7. \( \frac{x}{7} = \frac{21}{49} \)
8. \( \frac{x}{13} = \frac{15}{39} \)
9. \( \frac{x}{5} = \frac{10}{25} \)
10. \( \frac{x}{3} = \frac{6}{18} \)
11. \( \frac{2x}{3} = \frac{9}{10} \)
12. \( \frac{3x}{5} = \frac{36}{30} \)
13. \( \frac{x}{4} = \frac{25}{20} \)
14. \( \frac{x}{2} = \frac{22}{10} \)
15. \( \frac{x}{3} = \frac{45}{15} \)
16. \( \frac{x}{3} = \frac{63}{27} \)
17. \( \frac{x}{5} = \frac{100}{50} \)
18. \( \frac{x}{6} = \frac{8}{24} \)
When solving problems, draw a diagram to show what you have and what you need to find.

Example  CARNIVAL  Jim has to reach a target at a carnival game to win a prize. After 3 throws he has gone 75 feet, which is \( \frac{3}{4} \) of the way to the target. How far away is the target?

Explore  We know that 75 feet is \( \frac{3}{4} \) of the way to the target.

Plan  Draw a diagram to show the distance already thrown and the fraction it represents.

Solve  

\[
\begin{align*}
\text{Begin} & \quad \frac{1}{4} \quad \frac{1}{2} \quad \frac{3}{4} \quad 75 \text{ feet} \quad \text{Target} \\
\end{align*}
\]

If \( \frac{3}{4} \) of the distance is 75 feet, then \( \frac{1}{4} \) of the distance is 25 feet. So, the missing \( \frac{1}{4} \) must be another 25 feet.

\[
\begin{align*}
\text{Begin} & \quad +25 \quad +25 \quad +25 \quad 75 \text{ feet} \quad +25 \quad \text{Target} \\
\end{align*}
\]

The total distance that Jim must throw to hit the target is 100 feet.

Check  Since \( \frac{3}{4} \) of the total distance is 75 feet, the equation \( \frac{3}{4} \times x = 75 \) represents this problem. Solving, we get \( x = 100 \) feet. So, the solution checks.

Exercises

1. **SALES**  Sharon wants to buy a new car. She has saved up $1,500, which is approximately \( \frac{1}{5} \) of the price of the car. How much does she need to save in order to buy the new car?

2. **TRAVEL**  The Jones family has traveled 360 miles. They are \( \frac{4}{5} \) of the way to their destination. How far away is their destination?
Draw a diagram to solve.

1. **HOMEWORK** Shantel is studying for her History test. After 20 minutes, she is $\frac{1}{4}$ of the way done. How much longer will she study?

2. **RECIPES** Damon is making muffins. He has added $\frac{3}{4}$ of the ingredients. If he has added 6 ingredients, how many more does he have to add to be finished?

3. **TRAVEL** The Smithsons are going to Dallas, TX on vacation. They have traveled $\frac{1}{3}$ of the total distance. If they have traveled 126 miles, how far is it from their house to Dallas?

4. **PHYSICS** A ball is dropped from 256 feet above the ground. It bounces up $\frac{1}{4}$ as high as it fell. This is true for each successive bounce. What height will the ball reach on the third bounce?

5. **SCHOOL** Mrs. Wright says that $\frac{2}{3}$ of her class has arrived for the day. If 10 students have arrived, how many students are in her class?

6. **TRAVEL** Jeremy walked $\frac{1}{4}$ of the way to school, ran $\frac{1}{4}$ of the way to school, then rode with his best friend the rest of the way. If he walked 1.5 miles, how far did he ride with his friend?
Use the draw a diagram strategy to solve Exercises 1 and 2.

1. ANTS An ant went 2 meters away from its nest searching for food. The next time, the ant went 3 meters away. Each successive time the ant leaves the nest to search for food, the ant travels the sum of the two previous times. How far will the ant travel on his fifth trip?

2. NECKLACES The center bead of a pearl necklace has a 16 millimeter diameter. Each successive bead in each direction is \( \frac{3}{4} \) the diameter of the previous one. Find the diameter of the beads that are three away from the center bead.

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

**PROBLEM-SOLVING STRATEGIES**
- Use the four-step plan.
- Work backward.
- Eliminate possibilities
- Draw a diagram.

3. TALENT SHOW At a talent show, 60% of the acts were singing. One-third of the remaining acts were instrumental. If 12 acts were instrumental, how many acts were in the talent show?

4. GEOMETRY Miss Greenwell is adding 4 feet to the length and width of her rectangular garden as shown in the diagram. How much additional area will the garden have?

   \[ \text{Additional Area} = (10 + 4) \times (12 + 4) - 10 \times 12 \]

   A. 16 ft\(^2\)
   B. 104 ft\(^2\)
   C. 120 ft\(^2\)
   D. 224 ft\(^2\)

Select the Operation

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

5. YARD SALE Myron has sold $18.50 worth of items at his yard sale. A neighbor bought two items and handed Myron a $10 bill. Myron returned $7.75 in change. How much has Myron now sold?

6. COUNTRIES The table shows the total land area of five countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>8.5 million sq km</td>
</tr>
<tr>
<td>Canada</td>
<td>10.0 million sq km</td>
</tr>
<tr>
<td>China</td>
<td>9.6 million sq km</td>
</tr>
<tr>
<td>Russia</td>
<td>17.1 million sq km</td>
</tr>
<tr>
<td>United States</td>
<td>9.6 million sq km</td>
</tr>
</tbody>
</table>

Estimate how much more total area Russia has than China. Write in scientific notation.
1. **MONEY** Chantel has $125 left in her checking account after writing checks for $35, $22.50 and $16. What was her balance before she wrote the checks?

2. **GEOMETRY** Draw the next three figures in the pattern.

3. **PIZZA** Olivia has eaten $\frac{1}{3}$ of the pizza. If she has eaten 3 pieces, how many pieces were originally in the pizza?

4. **EXERCISE** Katlyn runs 2 miles after school each day and 3 miles on Saturday and 4 miles on Sunday. How many miles does she run during one week?

5. **WORK** Jefferson wants to work at least 25 hours this week. If he has already worked 22 hours, how many hours does he need to work on Saturday?

6. **TRAVEL** The bus to Washington has traveled $\frac{5}{6}$ of the way there. If it has traveled 80 miles, how much farther does it have to go?

7. **MUSEUMS** The Art Club is planning on attending a museum. The admission cost is $10 for adults and $7.50 for students. If they plan on having 2 adults attend as chaperones and have $150 saved from a fundraiser, what is the maximum number of students who can attend?

8. **SPORTS** Janean made 50 baskets during the week at practice. The table below shows when she made the baskets. How many baskets did she make on Friday?

<table>
<thead>
<tr>
<th>Day</th>
<th>Number of Baskets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>5</td>
</tr>
<tr>
<td>Tuesday</td>
<td>12</td>
</tr>
<tr>
<td>Wednesday</td>
<td>16</td>
</tr>
<tr>
<td>Thursday</td>
<td>7</td>
</tr>
<tr>
<td>Friday</td>
<td>??</td>
</tr>
</tbody>
</table>
**Get Ready for the Lesson**

Do the Mini Lab at the top of page 316 in your textbook. Write your answers below.

1. Let 1 unit on the grid paper represent 1 foot. So, 6 units = 6 feet. Convert all of your measurements to units.

2. On grid paper, make a drawing of your classroom like the one shown at the top of page 316.

**Read the Lesson**

3. Look at the map in the middle of page 316. What is the scale? What does the scale mean?

4. In Example 1, could you find the actual distance if you did not know the scale? Explain your answer.

5. Give another example of a scale drawing or scale model that is different from the examples of scale drawings and scale models given in this lesson in your textbook.

**Remember What You Learned**

6. How is a scale drawing similar to a scale model? How is it different?
A scale drawing represents something that is too large or too small to be drawn or built at actual size. Similarly, a scale model can be used to represent something that is too large or built too small for an actual-size model. The scale gives the relationship between the drawing/model measure and the actual measure.

Example

On this map, each grid unit represents 50 yards. Find the distance from Patrick’s Point to Agate Beach.

\[
\begin{align*}
\text{Scale} & \quad \text{Patrick’s Point to Agate Beach} \\
\text{map} & \quad \text{actual} \\
1 \text{ unit} & \quad 50 \text{ yards} \\
8 \text{ units} & \quad 50 \times 8 \\
1 \times x & = 50 \times 8 \\
x & = 400
\end{align*}
\]

Cross products
Simplify.

It is 400 yards from Patrick’s Point to Agate Beach.

Exercises

Find the actual distance between each pair of cities. Round to the nearest tenth if necessary.

<table>
<thead>
<tr>
<th>Cities</th>
<th>Map Distance</th>
<th>Scale</th>
<th>Actual Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Los Angeles and San Diego, California</td>
<td>6.35 cm</td>
<td>1 cm = 20 mi</td>
<td></td>
</tr>
<tr>
<td>2. Lexington and Louisville, Kentucky</td>
<td>15.6 cm</td>
<td>1 cm = 5 mi</td>
<td></td>
</tr>
<tr>
<td>3. Des Moines and Cedar Rapids, Iowa</td>
<td>16.27 cm</td>
<td>2 cm = 15 mi</td>
<td></td>
</tr>
<tr>
<td>4. Miami and Jacksonville, Florida</td>
<td>11.73 cm</td>
<td>1/2 cm = 20 mi</td>
<td></td>
</tr>
</tbody>
</table>

Suppose you are making a scale drawing. Find the length of each object on the scale drawing with the given scale. Then find the scale factor.

5. an automobile 16 feet long; 1 inch:6 inches

6. a lake 85 feet across; 1 inch = 4 feet

7. a parking lot 200 meters wide; 1 centimeter:25 meters

8. a flag 5 feet wide; 2 inches = 1 foot
ARCHITECTURE The scale on a set of architectural drawings for a house is \( \frac{1}{2} \) inch = \( 1\frac{1}{2} \) feet. Find the length of each part of the house.

<table>
<thead>
<tr>
<th>Room</th>
<th>Drawing Length</th>
<th>Actual Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Living Room</td>
<td>5 inches</td>
<td></td>
</tr>
<tr>
<td>2. Dining Room</td>
<td>4 inches</td>
<td></td>
</tr>
<tr>
<td>3. Kitchen</td>
<td>5( \frac{1}{2} ) inches</td>
<td></td>
</tr>
<tr>
<td>4. Laundry Room</td>
<td>3( \frac{1}{4} ) inches</td>
<td></td>
</tr>
<tr>
<td>5. Basement</td>
<td>10 inches</td>
<td></td>
</tr>
<tr>
<td>6. Garage</td>
<td>8( \frac{1}{3} ) inches</td>
<td></td>
</tr>
</tbody>
</table>

ARCHITECTURE As part of a city building refurbishment project, architects have constructed a scale model of several city buildings to present to the city commission for approval. The scale of the model is 1 inch = 9 feet.

7. The courthouse is the tallest building in the city. If it is 7\( \frac{1}{2} \) inches tall in the model, how tall is the actual building?

8. The city commission would like to install new flagpoles that are each 45 feet tall. How tall are the flagpoles in the model?

9. In the model, two of the flagpoles are 4 inches apart. How far apart will they be when they are installed?

10. The model includes a new park in the center of the city. If the dimensions of the park in the model are 9 inches by 17 inches, what are the actual dimensions of the park?

11. Find the scale factor.
For Exercises 1–3, use the diagram of a section of the art museum shown. Use a ruler to measure.

1. What is the actual length of the Impressionism Art room?

2. Find the actual dimensions of the Baroque Art room.

3. Find the scale factor for this blueprint.

Find the length of each model on the scale drawing with the given scale.

4. [Diagram of a train with a scale of 1 in. = 60 ft]

5. [Diagram of an arch with a scale of 1 cm = 4 meters]

6. [Diagram of an alligator with a scale of 2 in. = 1.5 ft]

7. **SKYSCRAPER** A model of a skyscraper is made using a scale of 1 inch:75 feet. What is the height of the actual building if the height of the model is 19 2/5 inches?

8. **GEOGRAPHY** Salem and Eugene, Oregon, are 64 miles apart. If the distance on the map is 3 1/4 inches, find the scale of the map.

9. **PYRAMIDS** The length of a side of the Great Pyramid of Khufu at Giza, Egypt, is 751 feet. If you were to make a model of the pyramid to display on your desk, which would be an appropriate scale: 1 in. = 10 ft or 1 ft = 500 ft? Explain your reasoning.
### Word Problem Practice

**Scale Drawings**

1. **CARS** A scale drawing of an automobile has a scale of 1 inch = \( \frac{1}{2} \) foot. The actual width of the car is 8 feet. What is the width on the scale drawing?

2. **MODELS** A model ship is built to a scale of 1 centimeter:5 meters. The length of the model is 30 centimeters. What is the length of the actual ship?

3. **BUILDING** Jose wants to build a model of a 180-meter tall building. He will be using a scale of 1.5 centimeters = 3.5 meters. How tall will the model be? Round your answer to the nearest tenth.

4. **TRAVEL** Susan is driving to Mount Shasta. On her map, she is a distance of \( 7\frac{3}{4} \) inches away. The scale of the map is \( \frac{1}{2} \) inch = 50 miles. How far must Susan travel to reach her destination?

5. **MAPS** A map of Levi’s property is being made with a scale of 2 centimeters:3 meters. What is the scale factor?

6. **LANDSCAPING** A pond is being dug according to plans that have a scale of 1 inch = 6.5 feet. The maximum distance across the pond is 9.75 inches on the plans. What will be the actual maximum distance across the pond?
Scale Drawings

Use the scale drawings of two different apartments to answer the questions.

1. Which apartment has the greater area?

2. What is the difference in square feet between Apartment A and Apartment B?

3. How much more closet space is offered by Apartment B than Apartment A?

4. How much more bathroom space is offered by Apartment B than Apartment A?

5. A one-year lease for Apartment A costs $450 per month. A one-year lease for Apartment B costs $525 per month. Which apartment offers the greatest value in terms of the cost per square foot?
Example

An architect was given a floor plan with corners at
\( A(0, 0), B(2, 0), C(2, 1), D(3, 1), E(3, 4), \) and \( F(0, 4). \)

Graph the scale drawing of the floor plan that has a scale of 1 to 2.

**Step 1**
Press \( \text{STAT} \) \( \text{ENTER} \) and enter the \( x \)-coordinates in column \( L1 \) and the \( y \)-coordinates in column \( L2 \). Repeat the first entry in each column at the end of each column.

**Step 2**
To graph a scale drawing with a scale factor of 2, multiply each coordinate in the ordered pairs by 2. Enter the new coordinates in columns \( L3 \) and \( L4 \).

**Step 3**
You must turn on the two point plots.

**Step 4**
Press \( \text{WINDOW} \) and make entries to match the settings shown.

**Step 5**
Press \( \text{GRAPH} \).

Exercises

Use a TI-83/84 Plus graphing calculator to draw the polygons and their scale drawings. (Reset \( \text{WINDOW} \) so that \( X_{\text{max}} = 20 \) and \( Y_{\text{max}} = 20 \).) Sketch the drawings. Label the vertices and coordinates of each polygon.

1. \( A(1, 2); B(3, 4); C(4, 3) \)
   scale: 1 to 5

2. \( A(4, 8); B(16, 16); C(12, 4) \)
   scale: 4 to 1

3. \( A(1, 6); B(6, 4); C(4, 2) \)
   scale: 1 to 3

4. \( A(1, 1); B(1, 3); C(3, 3); D(3, 1) \)
   scale: 1 to 4

5. \( A(18, 9); B(12, 9); C(6, 18); D(21, 18) \)
   scale: 3 to 1

6. Why did the upper right-hand corner of Exercise 5 not show on the screen?
Lesson Reading Guide

Fractions, Decimals, and Percents

Get Ready for the Lesson

Read the introduction at the top of page 324 in your textbook.
Write your answers below.

1. What percent of the teens said that the personal computer was the most important invention?

2. How is this percent written as a ratio?

3. Simplify the ratio.

Read the Lesson

4. Look at Example 1. Why is \( \frac{16.8}{100} \) multiplied by \( \frac{10}{10} \)?

5. Example 2 says to multiply by the reciprocal of 100. What is a reciprocal?

6. How do you write 100 as a fraction?

7. If the denominator is not a factor of 100, you can write fractions as percents by using a proportion. In Examples 3 and 4, why is the ratio \( \frac{n}{100} \) used as part of the proportions?

Remember What You Learned

8. Complete the following table of equivalent fractions. Look for patterns in each column. How do the percents increase? How do the fractions increase? Work with a partner. Figure out ways to remember the equivalents.

<table>
<thead>
<tr>
<th>Common Fraction/Decimal/Percent Equivalents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraction</td>
</tr>
<tr>
<td>( \frac{1}{3} )</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>( \frac{1}{8} )</td>
</tr>
</tbody>
</table>
Write $\frac{3}{8}\%$ as a fraction in simplest form.

\[
\frac{\frac{3}{8}}{100} = \frac{3}{8} \div 100
\]

Divide.

\[
= \frac{35}{8} \div 100
\]

Write $\frac{3}{8}$ as an improper fraction.

\[
= \frac{35}{8} \times \frac{1}{100}
\]

Multiply by the reciprocal of 100, which is $\frac{1}{100}$.

\[
= \frac{35}{800} \text{ or } \frac{7}{160}
\]

Simplify.

Write $\frac{5}{16}$ as a percent.

\[
\frac{5}{16} = \frac{n}{100}
\]

Write a proportion using $\frac{n}{100}$.

\[
500 = 16n
\]

Find the cross products.

\[
500 = 16n
\]

Divide each side by 16.

\[
31 \frac{1}{4} = n
\]

Simplify.

So, $\frac{5}{16} = 31 \frac{1}{4}\% \text{ or } 31.25\%$.

Write each percent as a fraction in simplest form.

1. $60\%$
2. $68 \frac{3}{4}\%$

3. $27 \frac{1}{2}\%$
4. $37.5\%$

Write each fraction as a percent. Round to the nearest hundredth if necessary.

5. $\frac{2}{5}$
6. $\frac{5}{8}$

7. $\frac{9}{16}$
8. $\frac{2}{3}$
Skills Practice

Fractions, Decimals, and Percents

Write each percent as a fraction in simplest form.

1. 18%
2. 67.5%
3. 21.25%
4. 87.5%
5. \(\frac{31}{4}\%\)
6. 17.5%
7. \(18\frac{3}{4}\%\)
8. \(68\frac{3}{4}\%\)
9. 7.5%
10. 12.5%
11. 36.75%
12. \(5\frac{1}{2}\%\)

Write each fraction as a percent. Round to the nearest hundredth if necessary.

13. \(\frac{3}{5}\)
14. \(\frac{3}{8}\)
15. \(\frac{2}{18}\)
16. \(\frac{3}{16}\)
17. \(\frac{7}{9}\)
18. \(\frac{21}{50}\)
19. \(\frac{1}{3}\)
20. \(\frac{40}{42}\)
21. \(\frac{7}{16}\)
22. \(\frac{64}{125}\)
23. \(\frac{11}{12}\)
24. \(\frac{11}{15}\)
6-8 Practice

Fractions, Decimals, and Percents

Write each percent as a fraction in simplest form.

1. 37.5%  
2. 5.8%  
3. 43.75%  
4. 52.5%  
5. 83 1/3%  
6. 66 2/3%  
7. 12 1/2%  
8. 21 3/4%

Write each fraction as a percent. Round to the nearest hundredth if necessary.

9. 13/20  
10. 9/25  
11. 7/8  
12. 39/40  
13. 5/9  
14. 6/7  
15. 49/200  
16. 4/15

Replace each • with >, < or = to make a true statement.

17. 3/16 • 24%  
18. 0.775 • 31/40  
19. 16% • 0.016

Order each set of numbers from least to greatest.

20. 0.6, 23%, 0.07, 2/3  
21. 4/5%, 0.37, 1/4, 0.4

22. SAVINGS Kayla has 14.5% of her salary placed into an Individual Retirement Account. What fraction is this?

23. INTERNET At home, 2 out of 5 people have access to broadband technology. What percent is this?

24. SPORTS A golfer made par on 13 of 18 holes. To the nearest tenth, on what percent of the holes did he make par?

ANALYZE TABLES For Exercises 25 and 26, use the table that shows the percent of households with the listed appliance.

25. What fraction of households have a clothes dryer?

26. Approximately 34 out of 67 households have a coffeemaker. Is this greater or less than the percent of households with a dishwasher? Explain.

<table>
<thead>
<tr>
<th>Appliance</th>
<th>Percent of Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerator</td>
<td>99.3%</td>
</tr>
<tr>
<td>Washing Machine</td>
<td>82.0%</td>
</tr>
<tr>
<td>Dryer</td>
<td>77.8%</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>56.0%</td>
</tr>
</tbody>
</table>

Source: census.gov
INTERNET For Exercises 1–4, use the table. It shows the percents of online shopping purchases made by all Internet users and the percents made by Internet users over age 55.

<table>
<thead>
<tr>
<th>Most Popular Online Purchases</th>
<th>Internet Users Over 55</th>
<th>All Internet Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>computer software</td>
<td>43%</td>
<td>19%</td>
</tr>
<tr>
<td>books</td>
<td>43%</td>
<td>21%</td>
</tr>
<tr>
<td>computer hardware</td>
<td>24%</td>
<td>13%</td>
</tr>
<tr>
<td>music CDs</td>
<td>29%</td>
<td>22%</td>
</tr>
<tr>
<td>clothing</td>
<td>19%</td>
<td>8%</td>
</tr>
</tbody>
</table>

1. What fraction of Internet users over 55 bought clothing online?

2. What fraction of all Internet users bought clothing online?

3. What fraction of all Internet users bought music CDs online?

4. Is the fraction of Internet users over 55 who bought books online greater or less than \( \frac{22}{50} \)? Explain.

5. FOOTBALL In 2005, Indianapolis quarterback Peyton Manning completed 305 out of 453 passes. What was his pass completion percentage to the nearest tenth?

6. COMPUTERS In Joan’s math class, there are 20 computers and 32 students. What percent of students will be able to use a computer without sharing?

7. VEHICLES In the town of Orick, 5 out of 13 vehicles are trucks. What percent of the vehicles are trucks? Round to the nearest tenth.

8. DENTISTRY Dana has fillings in 4 of her 32 teeth. What percent of her teeth have fillings?
Shaded Regions

The fractions or percents listed below each represent one of the shaded regions.

Match each fraction or percent with the shaded region it represents.

1. \( \frac{1}{2} \)
   - a.

2. \( \frac{25}{64} \)
   - d.

3. \( \frac{11}{16} \)
   - f.

4. 25%
   - b.

5. \( \frac{3}{4} \)
   - g.

6. 62\( \frac{1}{2} \)%
   - e.

7. \( \frac{29}{64} \)
   - h.

8. 37.5%
   - c.

9. \( \frac{7}{16} \)
TI-73 Activity
Fractions, Decimals, and Percents

Use the percent key, %, to express a number as a percent.

Example 1
Express 25% as a decimal and as a fraction.
Pressing the % key divides the preceding number by 100.

25 % ENTER So, 25% = 0.25.
F ← D ENTER So, 25% = 0.25 = \frac{1}{4}.

Example 2
Express 0.458 as a percent. Multiply by 100.

0.458 × 100 ENTER So, 0.458 = 45.8%.

Example 3
Express \frac{3}{8} as a percent.
First express \frac{3}{8} as a decimal. Then multiply by 100.

3 ÷ 8 ENTER So, \frac{3}{8} = 0.375
× 100 ENTER So, \frac{3}{8} = 0.375 = 37.5%.

Caution: Your calculator follows the order of operations. It applies the % before it does multiplication or division.

Exercises
Express each percent as a decimal and as a fraction. Write fractions in simplest form.

1. 55%
2. 86%
3. 140%
4. 30.5%
5. 250%
6. 0.8%

Express each fraction as a percent. Round to the nearest hundredth if necessary.

7. \frac{3}{4}
8. \frac{5}{8}
9. \frac{16}{20}
10. \frac{7}{16}
11. \frac{1}{3}
12. \frac{9}{12}
Get Ready for the Lesson

Do the Mini Lab at the top of page 329 in your textbook. Write your answers below.

1. What percent does Model 1 represent?
2. What percent does Model 2 represent?
3. Shade grids to represent each percent.
   a. 150%
   b. 215%
   c. 1/4%

Read the Lesson

4. If you are converting from a percent to a fraction or mixed number and the percent is greater than 100%, is the result a fraction or a mixed number? Explain.

5. In converting between decimals and percents, when do you use multiplication? When do you use division?

Remember What You Learned

6. Have you ever heard a coach encourage his or her team to “Give it a 110%!”? Describe what it means when a percent is greater than 100%. Describe what it means when a percent is less than 1%.
Examples

Write each percent as a decimal and as a mixed number or fraction in simplest form.

1. 280%
   \[280\% = \frac{280}{100}\] Definition of percent
   \[= 2.8\text{ or }2\frac{4}{5}\]

2. 0.12%
   \[0.12\% = \frac{0.12}{100}\] Definition of percent
   \[= 0.0012\text{ or }\frac{3}{2500}\]

Examples

Write each decimal as a percent.

3. 2.17
   \[2.17 = 217\%\] Multiply by 100.

4. 0.0034
   \[0.0034 = 0.0034\%\] Multiply by 100.

Exercises

Write each percent as a decimal and as a mixed number or fraction in simplest form.

1. 200%
2. 750%
3. 325%
4. 0.3%
5. 0.8%
6. 0.48%

Write each decimal as a percent.

7. 2.6
8. 19
9. 5.14
10. 0.008
11. 0.0014
12. 0.0067
Write each percent as a decimal and as a mixed number or fraction in simplest form.

1. 900%  
2. 150%  
3. 675%  

4. 245%  
5. 120%  
6. 0.2%  

7. 0.08%  
8. 0.12%  
9. 0.35%  

Write each decimal as a percent.

10. 3.9  
11. 81  
12. 25  

13. 6.75  
14. 2.81  
15. 0.001  

16. 0.0046  
17. 0.0069  
18. 0.0083  

Write each number as a percent.

19. \( \frac{61}{2} \)  
20. \( \frac{21}{2} \)  
21. \( \frac{51}{4} \)  

22. \( \frac{1}{200} \)  
23. \( \frac{2}{250} \)  
24. \( \frac{3}{500} \)
Practice

Percents Greater Than 100% and Percents Less Than 1%

Write each percent as a decimal and as a mixed number or fraction in simplest form.

1. 225%  
2. 550%  
3. 300%  
4. 800%

5. 0.8%  
6. 0.06%  
7. 0.45%  
8. 0.02%

Write each decimal as a percent.

9. 7.2  
10. 12  
11. 4.56  
12. 1.04

13. 0.001  
14. 0.008  
15. 0.0078  
16. 0.0092

Write each mixed number or fraction as a percent.

17. $4\frac{1}{2}$  
18. $8\frac{1}{4}$  
19. $\frac{1}{250}$  
20. $\frac{3}{400}$

Write each percent as a decimal.

21. $\frac{3}{8}$%  
22. $\frac{7}{10}$%  
23. $\frac{17}{20}$%  
24. $\frac{13}{25}$%

25. ATMOSPHERE Helium gas accounts for less than 0.01% of Earth’s atmospheric gases. Write this percent as a decimal and as a mixed number or fraction in simplest form. Then interpret its meaning.

26. STOCKS The stock of a particular company skyrocketed 1,550% in a one month period. Write this percent as a decimal and as a mixed number. Then interpret its meaning.

ANALYZE TABLES For Exercises 27 and 28, refer to the table shown.

27. Write the percent of Venus’s diameter compared to the Sun’s diameter as a decimal.

28. Which planet’s diameter is approximately $\frac{1}{200}$ of the sun’s diameter? Explain.

| Diameter Size Compared to the Sun’s Diameter |
|-----------------|------|
| Planet          | Percent |
| Mercury         | 0.35  |
| Venus           | 0.87  |
| Earth           | 0.92  |
| Mars            | 0.49  |

Source: motivate.maths.org
**Word Problem Practice**

**Percents Greater Than 100% and Percents Less Than 1%**

1. **INTERNET** Kilroy found that 0.70% of the documents from the Internet had names that ended in “.txt” or “.text”. Write this percent as a decimal and as a fraction.

2. **BUSINESS** Jocelyn expects her new software company to increase its sales next year $2\frac{3}{8}$ times their present value. Write this increase as a percent.

3. **UTILITIES** City records showed that 0.8% of new homes had no access to electricity. Write this percent as a decimal and as a fraction in simplest form.

4. **PETS** Berto got a puppy 8 weeks ago. In this time, the puppy’s weight increased 215%. Write this percent as a decimal and as a fraction.

5. **MANUFACTURING** The Quality Assurance department at a gear company found that there were 3 defective gears for every 675 produced. Write this as a fraction and as a percent. Round to the nearest hundredth.

6. **MEDICINE** Estelle’s pharmacist said that the medicine Estelle was taking contained no more than $\frac{1}{500}$ gram of impurities per gram of total weight. Write this fraction as a percent.
Helicopters became widely used in the early 1950s. However, did you know that a similar aircraft was developed in Spain nearly thirty years earlier? The inventor was Juan de la Cierva (1895–1936), and for many years his aircraft were used in rescue work. The modern helicopter is faster and more versatile, but it retains many features of Cierva’s design.

Fill in the blanks below to find what Cierva called his aircraft. On the line next to the decimal, fraction, or mixed number, write the letter matching the answer. If you have found the percents correctly, the letters read downward will spell out the name of the aircraft.

1. $\frac{3}{2}$

2. 0.006

3. 3.2

4. 2.9

5. 0.00029

6. 0.00006

7. $\frac{1}{200}$

8. $3\frac{1}{2}$

A 150%

G 0.029%

I 0.006%

O 350%

O 290%

R 0.5%

T 320%

U 0.6%
Student Recording Sheet

Use this recording sheet with pages 338–339 of the Student Edition.

Read each question. Then fill in the correct answer.

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D
9. A B C D
10. A B C D
11. A B C D

Pre-AP

Record your answers for Question 12 on the back of this paper.
Rubric for Scoring Pre-AP

(Use to score the Pre-AP question on page 339 of the Student Edition.)

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

Exercise 12 Rubric

<table>
<thead>
<tr>
<th>Score</th>
<th>Specific Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>The length represented by 12 cm is correctly determined to be 120 km. $\frac{4}{5}$ is correctly written as 80%. A complete explanation of how to find the number of items that were milk cartons is given including the proportion $\frac{4}{5} = \frac{x}{70}$. The number of items that were milk cartons is determined to be 56.</td>
</tr>
<tr>
<td>3</td>
<td>The computations and methods are correct. However, the explanation is correct but not complete. OR The methods and explanation are correct, but one computational error is made.</td>
</tr>
<tr>
<td>2</td>
<td>The represented length and the percent are correctly calculated, but the method for finding the number of items that were milk cartons is incorrect. OR The represented length and the number of items that were milk cartons are correctly calculated and explained, but the method for writing $\frac{4}{5}$ as a percent is incorrect. OR The percent and the number of items that were milk cartons are correctly calculated and explained, but the method for finding the represented length is incorrect.</td>
</tr>
<tr>
<td>1</td>
<td>Only one part (represented length, percent, and number of items that were milk cartons) is correct.</td>
</tr>
<tr>
<td>0</td>
<td>Response is completely incorrect.</td>
</tr>
</tbody>
</table>
Chapter 6 Quiz 1
(Lessons 6-1 and 6-2)

Write each ratio as a fraction in simplest form.

1. 54 students:9 chaperones
2. 21 cows to 91 bales of hay

Find each unit rate. Round to the nearest hundredth if necessary.

3. 325 meters in 28 seconds
4. 128 pounds of dog food for 16 dogs

5. MULTIPLE CHOICE The costs of different sizes of bottled sport drink are shown. Which bottle costs the least per ounce?

<table>
<thead>
<tr>
<th>Size</th>
<th>8 oz</th>
<th>16 oz</th>
<th>24 oz</th>
<th>32 oz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>$0.89</td>
<td>$1.09</td>
<td>$1.89</td>
<td>$2.39</td>
</tr>
</tbody>
</table>

A. 8 oz  B. 16 oz  C. 24 oz  D. 32 oz

Chapter 6 Quiz 2
(Lessons 6-3 and 6-4)

Complete.

1. 85 kg = ____ g
2. 160 mL = ____ L
3. How many grams are equivalent to 4,300 milligrams?
4. 18 yd = ____ ft
5. 14 qt = ____ gal
6. 3 1/2 lb = ____ oz
7. 32 in. = ____ ft
8. 1/2 mi = ____ ft
Chapter 6 Quiz 3
(Lessons 6-5, 6-6, and 6-7)

Solve each proportion.

1. \( \frac{25}{n} = \frac{40}{8} \)
2. \( \frac{z}{10} = \frac{15}{75} \)

3. **TREES** A tree farm is planting 16 rows of new trees. They have already planted \( \frac{3}{4} \) of the rows. How many more rows do they have left to plant?

On a map, the scale is \( \frac{1}{2} \) inch = 25 miles. For each map distance, find the actual distance.

4. 3 inches
5. \( 8 \frac{3}{4} \) inches

Chapter 6 Quiz 4
(Lessons 6-8 and 6-9)

Write each percent as a fraction in simplest form.

1. \( 15 \frac{1}{2}\% \)
2. 48%

Write each fraction as a percent.

3. \( \frac{7}{20} \)
4. \( \frac{3}{8} \)

Write each percent as a decimal and as a mixed number or fraction in simplest form.

5. 300%  
6. 0.5%

Write each decimal as a percent.

7. 7.5  
8. 0.068

9. Write \( 2 \frac{3}{4} \) as a percent.

10. What is \( \frac{3}{400} \) written as a percent?
Chapter 6 Mid-Chapter Test
(Lessons 6-1 through 6-4)

PART I

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

1. Write the ratio 8 yards to 64 yards as a fraction in simplest form.
   A. \(\frac{8}{1}\)  B. \(\frac{8}{64}\)  C. \(\frac{1}{8}\)  D. \(\frac{4}{32}\)  1. ___

2. Write the ratio 3 pounds to 10 ounces as a fraction in simplest form.
   F. \(\frac{24}{5}\)  G. \(\frac{48}{10}\)  H. \(\frac{10}{3}\)  J. \(\frac{3}{10}\)  2. ___

3. Find the unit rate of 192 crayons for 8 boxes.
   A. 0.04 crayon per box  C. 24 crayons per box
   B. 24 boxes per crayon  D. 192 crayons per 8 boxes  3. ___

4. Which of the following has the lowest unit price?

5. 0.34m = _____ mm
   A. 340  B. 34  C. 3.4  D. 0.0034  5. ___

6. 93.6L = _____ kL
   F. 93,600  G. 936  H. 0.936  J. 0.0936  6. ___

7. RACING A 5K race is 3.1 miles long. How many yards is this?
   A. 1,703 yd  B. 1,760 yd  C. 5,456 yd  D. 16,368 yd  7. ___

PART II

8. Write the ratio 6 inches to 2 feet as a fraction in simplest form.  8. _____________

9. Write the ratio 12 centimeters to 5 meters as a fraction in simplest form.  9. _____________

10. GASOLINE Mr. Lin put \(8\frac{1}{2}\) gallons of gasoline into his car. How many quarts of gasoline is this?  10. _____________

11. Find the unit rate of $14.30 for 11 glow-in-the-dark pencils.  11. _____________

12. Find the unit rate of 27,520 books in a 860-square-foot library.  12. _____________

13. Complete 0.031 kL = _____ L.  13. _____________
Choose the correct term or phrase to complete each sentence.

1. A(n) (ounce, ton) is a unit of weight equal to one sixteenth of a pound.

2. A proportion is an equation stating that two ratios are (equivalent, of different units).

3. Two ratios that have the same value are called (scale factors, equivalent ratios).

4. The (gram, liter) measures capacity.

5. A rate that is simplified so that it has a denominator (divisible by 10, of 1 unit) is called a unit rate.

6. To determine whether two ratios form a proportion, you can find their (cross products, unit rates).

7. A rate is a (scale factor, ratio) that compares two quantities with different kinds of units.

8. A (pint, quart) is a unit of capacity equal to two cups.

9. The (rate, scale) is the ratio of the model measure to the actual measure.

10. The prefix kilo- means (thousands, hundredths).

Define each term in your own words.

11. cross product

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

1. Write the ratio 21 inches to 3 feet as a fraction in simplest form.
   A. $\frac{1}{7}$ B. $\frac{7}{12}$ C. $\frac{21}{36}$ D. $\frac{5}{7}$ 1. _____

2. Are the ratios 85 tables to 18 chairs and 17 tables to 3 chairs equivalent? Explain.
   F. Yes; $\frac{85}{18} = \frac{17}{3}$. H. No; $\frac{85}{18} = \frac{17}{6}$. G. Yes; $\frac{18}{35} = \frac{17}{3}$. J. No; $\frac{85}{18}$ is in simplest form. 2. _____

3. Find the rate of $17.40 for 12 pairs of shoelaces as a unit rate.
   A. $2.09 per pair$ C. $1.37 per pair$ B. $1.45 per pair$ D. $0.69 per pair$ 3. _____

4. What is the unit rate of 192 cats in 96 square meters?
   F. 0.5 cat per square meter H. 12 cats per square meter G. 2 cats per square meter J. 25 cats per square meter 4. _____

5. BEST BUY Which size of yogurt shown in the table has the lowest unit price?
   A. 6 oz C. 10 oz B. 8 oz D. 32 oz
<table>
<thead>
<tr>
<th>Size (oz)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0.89</td>
</tr>
<tr>
<td>8</td>
<td>1.04</td>
</tr>
<tr>
<td>10</td>
<td>1.69</td>
</tr>
</tbody>
</table>
   | 32        | 4.79     | 5. _____

6. WALKATHON Students were $\frac{1}{2}$ finished with the walkathon when they reached the 2-kilometer mark. How long was the walkathon?
   F. 1 km H. $2\frac{1}{2}$ km G. 2 km J. 4 km 6. _____

For Questions 7 and 8, solve each proportion.

7. $\frac{118}{13} = \frac{59}{z}$
   A. 1.5 B. 6.5 C. 26 D. 535.5 7. _____

8. $\frac{g}{28} = \frac{148}{37}$
   F. 195.6 G. 112 H. 37 J. 7 8. _____

9. BUILDINGS A building is 120 meters tall. A scale model of the building uses a scale of 1 centimeter = 6 meters. How tall is the model?
   A. 20 cm B. 60 cm C. 20 m D. 60 m 9. _____
10. **ROOM DRAWING** On a scale drawing, the scale is \( \frac{1}{4} \text{ inch} = 1 \text{ foot} \). What are the dimensions on the scale drawing for a room that is 27 feet by 20 feet?

- F. \( \frac{9}{16} \text{ in.} \) by \( \frac{5}{12} \text{ in.} \)
- G. \( 2\frac{1}{4} \text{ in.} \) by \( 1\frac{2}{3} \text{ in.} \)
- H. \( 6\frac{3}{4} \text{ in.} \) by 5 in.
- J. \( 13\frac{1}{2} \text{ in.} \) by 10 in.

11. Write the fraction \( \frac{7}{8} \) as a percent.

- A. 875%
- B. 87.5%
- C. 8.75%
- D. 0.875%

12. Write \( 91\frac{2}{3}% \) as a fraction in simplest form.

- F. \( \frac{55}{60} \)
- G. \( \frac{11}{12} \)
- H. \( \frac{11}{4} \)
- J. \( \frac{275}{3} \)

13. Write 22.5% as a fraction in simplest form.

- A. \( \frac{225}{10} \)
- B. \( \frac{45}{100} \)
- C. \( \frac{9}{40} \)
- D. \( \frac{9}{100} \)

14. Write 0.09% as a decimal.

- F. 9
- G. 0.9
- H. 0.009
- J. 0.0009

15. Write 575% as a mixed number.

- A. \( 5\frac{3}{4} \)
- B. \( 50\frac{1}{4} \)
- C. \( 57\frac{1}{2} \)
- D. \( 500\frac{3}{4} \)

16. Write 0.399 as a percent.

- F. 399%
- G. 39.9%
- H. 3.99%
- J. 0.00399%

17. Write \( 7\frac{1}{8} \) as a percent.

- A. 7.125%
- B. 57%
- C. 71.25%
- D. 712.5%

**For Questions 18-20, complete.**

18. \( 6\frac{1}{2} \text{ pt} = \ ? \text{ c} \)

- F. 26
- G. 13
- H. \( 12\frac{1}{4} \)
- J. \( 3\frac{1}{4} \)

19. 30 in. = \( ? \) ft

- A. \( 2\frac{1}{2} \)
- B. \( 3\frac{1}{4} \)
- C. 42
- D. 360

20. 732 mm = \( ? \) m

- F. 0.732
- G. 7.32
- H. 73.2
- J. 732,000

**Bonus SURVEY** Jeri asked 30 classmates how many liked chocolate cake, how many liked white cake, and how many liked neither. Eleven liked chocolate cake, and seven liked white. Assuming that all of her classmates replied, what percent liked neither?
Write the letter for the correct answer in the blank at the right of each question.

1. Write the ratio 8 feet to 12 yards as a fraction in simplest form.
   A. \( \frac{8}{12} \)  
   B. \( \frac{2}{3} \)  
   C. \( \frac{1}{2} \)  
   D. \( \frac{2}{9} \)  
   1. ____

2. Are the ratios 4 boys to 9 girls and 12 boys to 18 girls equivalent? Explain.
   F. Yes; \( \frac{12}{18} = \frac{4}{9} \).
   H. Yes; \( \frac{9}{4} = \frac{18}{12} \).
   G. No; \( \frac{12}{18} = \frac{2}{3} \).
   J. No; \( \frac{18}{12} = \frac{3}{2} \).
   2. ____

3. Find the rate of $1.35 for 45 pieces of paper as a unit rate.
   A. 30¢ per piece  
   C. 3¢ per piece  
   B. 9¢ per piece  
   D. 0.03¢ per piece  
   3. ____

4. What is the unit rate of 232 people in 8 classrooms?
   F. 19 people per classroom  
   H. 32 people per classroom  
   G. 29 people per classroom  
   J. 58 people per classroom  
   4. ____

5. BEST BUY Which size package of pasta shown in the table has the lowest unit price?
<table>
<thead>
<tr>
<th>Size (oz)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0.99</td>
</tr>
<tr>
<td>8</td>
<td>2.59</td>
</tr>
<tr>
<td>16</td>
<td>5.69</td>
</tr>
<tr>
<td>32</td>
<td>11.89</td>
</tr>
</tbody>
</table>
   5. ____

6. CYCLING Cyclists were \( \frac{3}{4} \) finished with their ride when they reached the 15-kilometer mark. How long was their ride?
   F. 5 km  
   H. 15 km  
   G. 10 km  
   J. 20 km  
   6. ____

For Questions 7 and 8, solve each proportion. Round to the nearest hundredth if necessary.

7. \( \frac{30}{42} = \frac{55}{d} \)
   A. 77  
   B. 67  
   C. 39.29  
   D. 23  
   7. ____

8. \( \frac{w}{11} = \frac{8}{7} \)
   F. 12.57  
   G. 9.63  
   H. 5.09  
   J. 2.18  
   8. ____

9. MAPS On a map, the scale is 1 inch = 125 miles. What is the actual distance between two cities if the map distance is \( 2 \frac{3}{4} \) inches?
   A. 257 mi  
   B. \( 281 \frac{1}{4} \) mi  
   C. 325 mi  
   D. \( 343 \frac{3}{4} \) mi  
   9. ____
10. ROOM DRAWING On a scale drawing, the scale is $\frac{1}{4}$ inch:1 foot. What is the scale factor?

F. $\frac{12}{1}$  
G. $\frac{1}{4}$  
H. $\frac{1}{24}$  
J. $\frac{1}{48}$  

11. Write the fraction $\frac{17}{23}$ as a percent to the nearest hundredth.

A. 135.29%  
B. 73.91%  
C. 35.29%  
D. 0.74%  

12. Write $68\frac{3}{4}$% as a fraction in simplest form.

F. $\frac{275}{4}$  
G. $\frac{6875}{100}$  
H. $\frac{11}{16}$  
J. $\frac{4}{275}$  

13. Write 39.5% as a fraction in simplest form.

A. $\frac{395}{10}$  
B. $\frac{79}{100}$  
C. $\frac{158}{200}$  
D. $\frac{79}{200}$  

14. Write 0.02% as a decimal.

F. 0.0002  
G. 0.002  
H. 0.02  
J. 2.0  

15. Write 155% as a mixed number.

A. $1\frac{5}{20}$  
B. $1\frac{11}{20}$  
C. $15\frac{1}{2}$  
D. $100\frac{11}{20}$  

16. Write 24 as a percent.

F. 2,400%  
G. 240%  
H. 2.4%  
J. 0.24%  

17. Write $1\frac{3}{5}$ as a percent.

A. 1.6%  
B. 13.5%  
C. 135%  
D. 160%  

For questions 18-20, complete.

18. 12,000 lb = ____ T  
F. 24,000  
G. 6,000  
H. 24  
J. 6  

19. 5 qt = ____ pt  
A. $\frac{5}{4}$  
B. $2\frac{1}{2}$  
C. 10  
D. 20  

20. 9.2 g = ____ mg  
F. 0.0092  
G. 92  
H. 920  
J. 9,200  

Bonus INVITATIONS Anita sent out invitations to a party and received an RSVP from every invitation. Thirteen of the RSVPs came back with a yes response, and seven RSVPs came back with a no response. What percent of the people that Anita invited to her party are not coming?
Write the letter for the correct answer in the blank at the right of each question.

1. Write the ratio 1 inch to 1 foot as a fraction in simplest form.
   A. \( \frac{12}{1} \)  
   B. \( \frac{2}{1} \)  
   C. \( \frac{1}{1} \)  
   D. \( \frac{1}{12} \)  

2. Are the ratios 5 dogs to 7 cats and 25 dogs to 35 cats equivalent? Explain.
   F. No; \( \frac{5}{7} \neq \frac{25}{35} \).  
   H. Yes; \( \frac{25}{35} = \frac{5}{7} \).  
   G. No; \( \frac{35}{25} = \frac{7}{5} \).  
   J. Yes; \( \frac{35}{25} = \frac{7}{5} \).  

3. Find the rate of $1.50 for 25 pencils as a unit rate.
   A. 0.06¢ per pencil  
   B. 6¢ per pencil  
   C. 25¢ per pencil  
   D. 60¢ per pencil  

4. TRAVEL Express the rate of traveling 392 miles in 7 hours as a unit rate.
   F. 17.8 mph  
   H. 56 mph  
   G. 27 mph  
   J. 65 mph  

5. BEST BUY Which size can of soup shown in the table has the lowest unit price?
<table>
<thead>
<tr>
<th>Size (oz)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.79</td>
</tr>
<tr>
<td>15</td>
<td>1.29</td>
</tr>
<tr>
<td>18</td>
<td>2.16</td>
</tr>
<tr>
<td>32</td>
<td>3.19</td>
</tr>
</tbody>
</table>

6. CYCLING Cyclists were \( \frac{3}{4} \) finished with their ride when they reached the 18-kilometer mark. How long was their ride?
   F. 6 km  
   G. 12 km  
   H. 18 km  
   J. 24 km  

7. For Questions 7 and 8, solve each proportion.
   \( \frac{51}{y} = \frac{27}{45} \)
   A. 85  
   B. 30.6  
   C. 24  
   D. 0.012  

8. \( \frac{22}{11} = \frac{r}{13} \)
   F. 26  
   G. 18  
   H. 6.5  
   J. 3.18  

9. MAPS On a map, the scale is 1 inch = 125 miles. What is the actual distance between two cities if the map distance is 4 inches?
   A. 525 mi  
   B. 505 mi  
   C. 500 mi  
   D. 281\( \frac{1}{4} \) mi  

NAME ________________________________________ DATE ______________ PERIOD _____

Chapter 6 Test, Form 2B

SCORE _____
10. SCALE DRAWING On a scale drawing, the scale is 5 cm:1 m.
   What is the scale factor?
   
   F. \( \frac{5}{1} \)  
   G. \( \frac{1}{5} \)  
   H. \( \frac{1}{20} \)  
   J. \( \frac{1}{100} \)  

11. Write the fraction \( \frac{5}{11} \) as a percent to the nearest hundredth.
   
   A. 0.45%  
   B. 2.20%  
   C. 4.55%  
   D. 45.45%  

12. Write \( 18\frac{3}{4}\% \) as a fraction in simplest form.
   
   F. \( \frac{75}{4} \)  
   G. \( \frac{75}{100} \)  
   H. \( \frac{5}{16} \)  
   J. \( \frac{3}{16} \)  

13. Write 5.8% as a fraction in simplest form.
   
   A. \( \frac{29}{1000} \)  
   B. \( \frac{29}{500} \)  
   C. \( \frac{58}{100} \)  
   D. \( \frac{58}{10} \)  

14. Write 0.12% as a decimal.
   
   F. 0.0012  
   G. 1.2  
   H. 12  
   J. 120  

15. Write 250% as a mixed number.
   
   A. \( 2\frac{1}{20} \)  
   B. \( 2\frac{1}{2} \)  
   C. 25  
   D. \( 25\frac{1}{2} \)  

16. Write 0.008 as a percent.
   
   F. 8%  
   G. 0.8%  
   H. 0.08%  
   J. 0.00008%  

17. Write \( 5\frac{3}{4} \) as a percent.
   
   A. 575%  
   B. 57.5%  
   C. 23%  
   D. 5.75%  

For questions 18-20, complete.

18. \( 9,000 \text{ lb} = \ ? \text{T} \)
   
   F. 3  
   G. \( 4\frac{1}{2} \)  
   H. 18  
   J. 18,000  

19. \( 3 \text{ qt} = \ ? \text{ pt} \)
   
   A. 18  
   B. 12  
   C. 6  
   D. \( 1\frac{1}{2} \)  

20. \( 22 \text{ kg} = \ ? \text{ g} \)
   
   F. 0.022  
   G. 220  
   H. 2,200  
   J. 22,000  

Bonus SCHOOL In Juan’s math class, there are 18 boys and 14 girls. What percent of Juan’s class is girls?
   
   B: ______________________
1. **SHOPPING**  Which size bag of cat food shown in the table has the lowest unit price?

<table>
<thead>
<tr>
<th>Size (oz)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>5.49</td>
</tr>
<tr>
<td>40</td>
<td>8.00</td>
</tr>
<tr>
<td>64</td>
<td>15.99</td>
</tr>
</tbody>
</table>

Write each ratio as a fraction in simplest form.

2. 12:18

3. 30 seconds to 5 minutes

Determine whether the ratios are equivalent. Explain.

4. 6 out of 13 students
   30 out of 65 students

5. 3 magazines to 5 books
   5 magazines to 7 books

Find each unit rate. Round to the nearest hundredth if necessary.

6. $5.85 for 39 lollipops

7. 236 gallons for 4 minutes

8. $9.25 for 18 pounds

9. **CYCLING**  Cyclists were \(\frac{3}{5}\) finished with their ride when they reached the 15-kilometer mark. How long was their ride?

10. **WATER**  A grocery store sells bottles of water 6 for $4 and 18 bottles of water for $10. Is the cost of the water proportional to the number sold? Explain.

Solve each proportion.

11. \(\frac{k}{13} = \frac{6}{5}\)

12. \(\frac{18}{j} = \frac{3}{16}\)

13. \(\frac{5}{14} = \frac{l}{7}\)

**SCALE DRAWING**  For Questions 14 and 15, suppose you are making a scale drawing. Find the length of each object on the scale drawing with the given scale. Then find the scale factor.

14. a room 14 feet long; 1 inch = 6 feet

15. a tower 40 meters tall; 0.8 centimeter = 1 meter
16. MAP On a map, the scale is 1 inch = 2.5 miles. Find the dimensions of a school district that is 4 inches by 9 inches on the map.

Write each percent as a fraction in simplest form.

17. $\frac{93}{8}\%$
18. 67.5%

Write each fraction as a percent. Round to the nearest hundredth if necessary.

19. $\frac{47}{80}$
20. $\frac{5}{22}$

Write each percent as a decimal and as a mixed number or fraction in simplest form.

21. 175%
22. 0.65%

Write each decimal as a percent.

23. 6.7
24. 0.002

Write each number as a percent.

25. $\frac{3}{500}$
26. $8\frac{1}{4}$

27. GROCERIES Eggs are on sale 2 dozen for $1.98. At this rate, find the cost of 3 dozen eggs to the nearest cent.

For questions 28-33, complete.

28. 6 c = ? fl oz
29. 54 in. = ? ft
30. $3\frac{1}{2}$ lb = ? oz
31. 67 L = ? kL
32. 0.14 m = ? mm
33. 2,900 mg = ? g

Bonus SURVEY The results of a survey conducted by the student council of Mt. Ashwood Middle School showed that 9 out of 24 students were planning to attend the spring dance. If there are 1,656 students at Mt. Ashwood, how many students are not planning to attend the spring dance?
1. **SHOPPING** Which size of laundry detergent shown in the table has the lowest unit price?

<table>
<thead>
<tr>
<th>Size (L)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4.99</td>
</tr>
<tr>
<td>6</td>
<td>9.99</td>
</tr>
<tr>
<td>12</td>
<td>18.99</td>
</tr>
</tbody>
</table>

Which size of detergent has the lowest unit price?

2. Write each ratio as a fraction in simplest form.
   2. \(27:72\)
   3. 8 ounces to 2 pounds

3. Determine whether the ratios are equivalent. Explain.
   4. 5 students to 11 adults
   5. $5 for 8 pounds
      11 students to 5 adults
      $25 for 40 pounds

4. Find each unit rate. Round to the nearest hundredth if necessary.
   6. $1.59 for 3 pounds
   7. 114 stickers for 38 students
   8. 14 gallons for every 3 turtles

5. **CYCLING** Cyclists were \(\frac{3}{5}\) finished with their ride when they reached the 18-kilometer mark. How long was their ride?

6. **WATER** A grocery store sells bottles of water 6 for $4 and 18 bottles of water for $12. Is the cost of the water proportional to the number sold? Explain.

7. Solve each proportion.
   11. \(\frac{7}{m} = \frac{4}{5}\)
   12. \(\frac{14}{5} = \frac{q}{3}\)
   13. \(\frac{p}{6} = \frac{5}{3}\)

8. **SCALE DRAWING** For Questions 14 and 15, suppose you are making a scale drawing. Find the length of each object on the scale drawing with the given scale. Then find the scale factor.
   14. a room 12 feet wide; 1 inch = 5 feet
   15. a building 20 meters tall; 0.4 centimeter = 1 meter

9. **MAP** On a map, the scale is 1 inch = 10 miles. Find the dimensions of a town that is 3 inches by 4.5 inches on the map.
Write each percent as a fraction in simplest form.

17. $11\frac{1}{9}\%$

18. 43.75\%

Write each fraction as a percent. Round to the nearest hundredth if necessary.

19. $\frac{13}{40}$

20. $\frac{2}{11}$

Write each percent as a decimal and as a mixed number or fraction in simplest form.

21. 550\%

22. 0.32\%

Write each decimal as a percent.

23. 9.4

24. 0.008

Write each number as a percent.

25. $\frac{3}{400}$

26. $6\frac{3}{4}$

27. GROCERIES Eggs are on sale 3 dozen for $2.97. At this rate, find the cost of 4 dozen eggs to the nearest cent.

For questions 28-33, complete.

28. 7 c = __?__ fl oz

29. 78 in. = __?__ ft

30. 5\frac{1}{2} lb = __?__ oz

31. 4.8 m = __?__ cm

32. 13.8 g = __?__ mg

33. 0.5 m = __?__ mm

Bonus SURVEY The results of a survey conducted by the football coach at East High School showed that 8 out of 20 students were planning to attend the homecoming football game. If there are 1,560 students at East High School, how many students are not planning to attend the homecoming game?
1. **SHOPPING** Which size jar of jelly shown in the table has the lowest unit price?

<table>
<thead>
<tr>
<th>Size (oz)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1.69</td>
</tr>
<tr>
<td>16</td>
<td>3.19</td>
</tr>
<tr>
<td>32</td>
<td>5.79</td>
</tr>
</tbody>
</table>

Write each ratio as a fraction in simplest form.

2. 36:60

3. 5 hours to 45 minutes

Determine whether the ratios are equivalent. Explain.

4. 2 flute players to 3 violinists
   16 flute players to 24 violinists

5. $9 for 16 pounds
   $3 for 4 pounds

Find each unit rate. Round to the nearest hundredth if necessary.

6. 48 miles in 5 hours

7. $10.50 for 15 pounds

8. 29 gallons for 3 minutes

9. **WALKATHON** Volunteers were \(\frac{3}{4}\) finished with the walkathon when they reached the \(4\frac{1}{2}\)-kilometer mark. How long was the walkathon?

10. **WATER** A grocery store sells bottles of water 6 for $4.80 and 18 bottles of water for $22.50. Is the cost of the water proportional to the number sold? Explain.

Solve each proportion.

11. \(\frac{x}{6} = \frac{3}{8}\)

12. \(\frac{4.3}{2.5} = \frac{w}{4}\)

13. \(\frac{6}{v} = \frac{3}{11}\)

**SCALE DRAWING** For Questions 14 and 15, suppose you are making a scale drawing. Find the length of each object on the scale drawing with the given scale. Then find the scale factor.

14. a parking lot 480 meters wide; 1 centimeter = 16.5 meters

15. a desk 6 feet long; 1.5 inches = 0.5 feet
16. **MAP** On a map, the scale is 1 inch = 5 miles. Find the dimensions of a national park that is 8 inches by 1 foot on the map.

Write each percent as a fraction in simplest form.

17. 5.5%  
18. $81\frac{1}{4}$%

Write each fraction as a percent. Round to the nearest hundredth if necessary.

19. $\frac{31}{80}$  
20. $\frac{7}{12}$

Write each percent as a decimal and a mixed number or fraction in simplest form.

21. 295%  
22. 0.08%

Write each decimal as a percent.

23. 29  
24. 0.0044

Write each number as a percent.

25. $2\frac{3}{8}$  
26. $\frac{1}{500}$

27. **ENTERTAINMENT** A group bought 8 tickets to a show for a total $118. At this rate, find the cost of 3 tickets.

28. $7\frac{3}{4}$ c = ___ fl oz  
29. 68 in. = ___ ft  
30. $3\frac{1}{2}$ T = ___ lb  
31. 26,300 cm = ___ m  
32. 150 L = ___ kL  
33. 24,500 mg = ___ kg

**Bonus SCHOOL** Out of 700 students in the seventh grade, 9 out of 25 wanted the class colors to include blue. Of the number remaining, half wanted green. How many of the seventh-grade students did not want green to be included as a class color?
Chapter 6
Extended-Response Test

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

1. List three pairs of ratios that are equivalent.
2. Explain what is meant by a proportion.
3. Draw counters in each box to complete each proportion.

   a. \(\frac{2}{3} = \frac{\text{○○○○○}}{}\)

   b. \(\frac{\text{○○○○○○○○}}{\text{○○○}} = \frac{1}{2}\)

   c. \(\frac{3}{4} = \frac{}{\text{□□□□}}\)

4. A rectangular house is 64 feet long and 32 feet wide. Draw a scale drawing of the house. Use the scale 1 millimeter = 1 foot.
Part 1: Multiple Choice

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

1. Write $9 \cdot 9 \cdot 9 \cdot 9 \cdot 9$ in exponential form. (Lesson 1-2)
   
   A $5^9$  
   B $9^5$  
   C $59,049$  
   D $1,953,125$  

   1. © © © ©

2. Which point is located at $-4$ on the number line? (Lesson 2-1)
   
   $R$  
   $S$  
   $T$  
   $V$

   F $R$  
   G $S$  
   H $T$  
   J $V$

   2. © © © ©

3. FAIR The state fair charges $7.00 plus $1.00 for each ride. Which expression could be used to find the price of a fair admission with $r$ rides? (Lesson 3-5)
   
   A $8r$  
   B $7r + 1$  
   C $7 + 1r$  
   D $7r + 1r$

   3. © © © ©

4. Find the area of a rectangle with a width of 8 meters and a length of 5 meters. (Lesson 3-6)
   
   F $80 \text{ m}^2$  
   G $40 \text{ m}^2$  
   H $26 \text{ m}^2$  
   J $13 \text{ m}^2$

   4. © © © ©

5. Choose the equation that is graphed. (Lesson 3-7)
   
   A $y = -3x + 2$  
   B $y = x + 2$  
   C $y = 3x + 2$  
   D $y = 3x - 2$

   5. © © © ©

6. Write $\frac{18}{21}$ in simplest form. (Lesson 4-4)
   
   F $\frac{9}{10}$  
   G $\frac{36}{42}$  
   H $\frac{2}{3}$  
   J $\frac{6}{7}$

   6. © © © ©

7. Write $4\frac{3}{8}$ as a decimal. (Lesson 4-5)
   
   A $0.4375$  
   B $4.375$  
   C $4.38$  
   D $43.75$

   7. © © © ©

8. Write the ratio $\frac{53}{5}$ out of 100 as a percent. (Lesson 4-6)
   
   F $53\%$  
   G $50\frac{2}{5}\%$  
   H $53.5\%$  
   J $56\%$

   8. © © © ©

9. Find $\frac{11}{12} - \frac{1}{2}$. Write in simplest form. (Lesson 5-2)
   
   A $\frac{5}{12}$  
   B $\frac{5}{6}$  
   C $1$  
   D $1\frac{5}{12}$

   9. © © © ©

10. ADVERTISEMENTS A magazine has 20 ads that are each an eighth page. How many pages of ads are there? (Lesson 5-5)
    
    F $1.5$ pages  
    G $2$ pages  
    H $2.5$ pages  
    J $5$ pages

   10. © © © ©
11. Find the unit rate for $2.65 for 5 ounces. (Lesson 6-2)
   - A $53 per oz
   - B $13.25 per oz
   - C $1.89 per oz
   - D $0.53 per oz

12. Which pair of ratios forms a proportion? (Lesson 6-5)
   - F \(\frac{12 \text{ mi}}{2 \text{ h}} = \frac{20 \text{ mi}}{4 \text{ h}}\)
   - G \(\frac{1}{16} = \frac{16}{1}\)
   - H \(\frac{18}{15} = \frac{6}{5}\)
   - J \(\frac{3}{8} = \frac{16}{6}\)

13. SCALE MODEL A room is 12 feet wide. A scale model of the room has a scale of 1 inch = 6 feet. What is the width of the room in the model? (Lesson 6-7)
   - A 2 in.
   - B 6 in.
   - C 1 ft
   - D 2 ft

14. Write 43\(\frac{3}{4}\)% as a fraction in simplest form. (Lesson 6-8)
   - F \(\frac{4}{175}\)
   - G \(\frac{7}{16}\)
   - H \(\frac{35}{80}\)
   - J \(\frac{175}{4}\)

15. FAIRS Attendance at a state fair increased by 114%. Write 114% as a decimal. (Lesson 6-9)
   - A 0.0114
   - B 1.14
   - C 11.4
   - D 114

16. Solve \(-2y - 19 = -43\). (Lesson 3-5)
   - F \(-31\)
   - G \(-12\)
   - H \(12\)
   - J \(64\)

17. Convert \(\frac{2}{5}\) ton to pounds. (Lesson 6-3)
   - A 400
   - B 800
   - C 2000
   - D 5000
18. Graph points $R(-4, 1)$ and $S(2, -3)$. (Lesson 2-3)

19. Evaluate $a - b$ if $a = -21$ and $b = -4$. (Lesson 2-5)

20. Find the LCD for $\frac{3}{5}$ and $\frac{7}{9}$. (Lesson 4-9)

21. Solve $0.3 = \frac{10}{2.7}$. (Lesson 5-6)

22. CYCLING A person bikes 30 miles in $2 \frac{1}{2}$ hours. What is the unit rate? (Lesson 5-7)

23. Write the ratio 16 hours to 2 days as a fraction in simplest form. (Lesson 6-1)

24. Write 15.5% as a fraction in simplest form. (Lesson 6-8)

25. PACKAGES Francisca delivers 136 packages during her 8-hour shift. (Lesson 6-2)
   
a. What is her unit rate?

b. Tricia delivers 128 packages during her 6-hour shift. Is her unit rate less than, greater than, or equal to Francisca’s unit rate? Explain.
Anticipation Guide
Ratio and Proportion

Before you begin Chapter 6

- 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>To determine if two ratios are equivalent, write both ratios in simplest form.</td>
<td>A</td>
</tr>
<tr>
<td>2.</td>
<td>A rate is called a unit rate only when it has a denominator of 1 unit.</td>
<td>A</td>
</tr>
<tr>
<td>3.</td>
<td>When converting larger units to smaller units in the Customary measurement system division is used.</td>
<td>D</td>
</tr>
<tr>
<td>4.</td>
<td>Since there are 2 cups in a pint, 8 cups is equal to 4 pints.</td>
<td>A</td>
</tr>
<tr>
<td>5.</td>
<td>The cross products of $\frac{2}{3}$ and $\frac{7}{8}$ are 14 and 40.</td>
<td>D</td>
</tr>
<tr>
<td>6.</td>
<td>A blue print drawing of a house with a scale of 1 inch = 6 feet would be larger than a blue print drawing of the same house with a scale of $\frac{1}{4}$ inch = 1.5 feet.</td>
<td>D</td>
</tr>
<tr>
<td>7.</td>
<td>$\frac{1}{4}$ is the same as 33 $\frac{1}{3}$.</td>
<td>A</td>
</tr>
<tr>
<td>8.</td>
<td>To write a fraction as a percent you could first write the fraction as a decimal, and then convert the decimal to a percent.</td>
<td>A</td>
</tr>
<tr>
<td>9.</td>
<td>To divide a decimal by 100, move the decimal point 2 places to the right.</td>
<td>D</td>
</tr>
<tr>
<td>10.</td>
<td>Percents can only be written with whole numbers.</td>
<td>D</td>
</tr>
</tbody>
</table>

After you complete Chapter 6

- 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.

Get Ready for the Lesson
Read the introduction at the top of page 282 in your textbook. Write your answers below.

1. Write the student-teacher ratio of Prairie Lake Middle School as a fraction. Then write this fraction with a denominator of 1. \[ \frac{396}{18} \quad \frac{22}{1} \]

2. Can you determine which school has the lowest student-teacher ratio by examining just the number of teachers at each school? Just the number of students at each school? Explain.
   No; Green Briar has the lowest student-teacher ratio, but actually has the most teachers.

Read the Lesson
For Exercises 3 and 4, review the introduction to this lesson.

3. What two things are being compared? total number of students to total number of teachers

4. What is the comparison of the size of the larger school to the size of the smaller school called? the school ratio

5. When you simplify a ratio written as an improper fraction, should you rewrite the fraction as a mixed number? No; leave the fraction as an improper fraction.

Remember What You Learned
6. Comparing measurements requires you to know how to convert measurements easily. Complete the following table to help you remember some common conversions.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Equivalent Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 foot</td>
<td>12 inches</td>
</tr>
<tr>
<td>1 yard</td>
<td>3 feet</td>
</tr>
<tr>
<td>1 year</td>
<td>52 weeks</td>
</tr>
<tr>
<td>1 pound</td>
<td>16 ounces</td>
</tr>
<tr>
<td>1 gallon</td>
<td>4 quarts</td>
</tr>
<tr>
<td>1 quart</td>
<td>2 pints</td>
</tr>
</tbody>
</table>
Any ratio can be written as a fraction. To write a ratio comparing measurements, such as units of length or units of time, both quantities must have the same unit of measure. Two ratios that have the same value are equivalent ratios.

**Example 1**

Write the ratio 15 to 9 as a fraction in simplest form.

\[
\frac{15}{9} \quad \text{Write the ratio as a fraction.}
\]

\[
\frac{5}{3} \quad \text{Simplify.}
\]

Written as a fraction in simplest form, the ratio 15 to 9 is \( \frac{5}{3} \).

**Example 2**

Determine whether the ratios 10 cups of flour in 4 batches of cookies and 15 cups of flour in 6 batches of cookies are equivalent ratios.

Compare ratios written in simplest form.

\[
\frac{10 \text{ cups}}{4 \text{ batches}} = \frac{10 - \frac{2}{2}}{4 - \frac{2}{2}} = \frac{\frac{2}{2}}{2} \quad \text{Divide the numerator and denominator by the GCF, 2}
\]

\[
\frac{15 \text{ cups}}{6 \text{ batches}} = \frac{15 - \frac{3}{2}}{6 - \frac{3}{2}} = \frac{\frac{3}{2}}{2} \quad \text{Divide the numerator and denominator by the GCF, 3}
\]

Since the ratios simplify to the same fraction, the ratios of cups to batches are equivalent.

**Exercises**

Write each ratio as a fraction in simplest form.

1. 30 to 12
   \( \frac{30}{12} = \frac{5}{2} \)
2. 5:20
   \( \frac{5}{20} = \frac{1}{4} \)
3. 49:42
   \( \frac{49}{42} = \frac{7}{6} \)
4. 15 to 13
   \( \frac{15}{13} \)
5. 28 feet:35 feet
   \( \frac{28}{35} = \frac{4}{5} \)
6. 24 minutes:18 minutes
   \( \frac{24}{18} = \frac{4}{3} \)
7. 75 seconds:150 seconds
   \( \frac{75}{150} = \frac{1}{2} \)
8. 12 feet:60 feet
   \( \frac{12}{60} = \frac{1}{5} \)

Determine whether the ratios are equivalent. Explain.

9. \( \frac{3}{4} \) and \( \frac{12}{16} \)
   - yes; \( \frac{3}{4} = \frac{12}{16} \)
10. 12:17 and 10:15
    - no; 12:17 = \( \frac{12}{17} \), 10:15 = \( \frac{10}{15} \), \( \frac{12}{17} \neq \frac{10}{15} \)
11. 25 and 30
    - yes; \( \frac{25}{30} = \frac{5}{6} \)
12. 2 lb:36 oz and 3 lb:44 oz
    - no; 2 lb:36 oz = \( \frac{8}{9} \), 3 lb:44 oz = \( \frac{12}{11} \) and \( \frac{8}{9} \neq \frac{12}{11} \)
13. 1 ft:4 in. and 3 ft:12 in.
    - yes; 1 ft:4 in. = \( \frac{1}{4} \), and 3 ft:12 in. = \( \frac{3}{4} \)

14. 33 ounces to 11 ounces
   - \( \frac{33}{11} \)
15. 84 to 16
   - \( \frac{84}{16} = \frac{21}{4} \)
16. 45 minutes:25 minutes
   - \( \frac{45}{25} = \frac{9}{5} \)
17. 9 weeks:15 weeks
   - \( \frac{9}{15} \)
18. 3 yards to 33 yards
   - \( \frac{3}{33} \)
19. 18:21
   - \( \frac{18}{21} \)
20. 7:10 and 8:11
   - yes; \( \frac{7}{10} = \frac{9}{11} \)
21. 18 in.:3 ft and 12 in.:2 ft
   - yes; 18 in.:3 ft = \( \frac{1}{2} \), 12 in.:2 ft = \( \frac{1}{2} \)
22. 6 mos:2 yr and 8 mos:3 yr
   - no; 6 mos:2 yr = \( \frac{1}{4} \), 8 mos:3 yr = \( \frac{2}{9} \), and \( \frac{1}{4} \neq \frac{2}{9} \)

Chapter 6

Glencoe California Mathematics, Grade 6
### Ratios

**6-1 Practice**

**Survey** For Exercises 1-3, use the responses to a survey to write each ratio as a fraction in simplest form.

<table>
<thead>
<tr>
<th>Survey Responses</th>
<th>Yes</th>
<th>No</th>
<th>Not Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. yes responses:</td>
<td>18</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>2. no responses:</td>
<td>9</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3. not sure responses:</td>
<td>2</td>
<td>3</td>
<td>14</td>
</tr>
</tbody>
</table>

**County Fair** For Exercises 4-9, use the following information to write each ratio as a fraction in simplest form.

At its annual fair, Westborough County had 27 food booths and 63 game booths. A total of 1,350 adults and 3,600 children attended. The fair made a profit of $42,000. Of this money, $12,600 came from food sales.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>33</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>36</td>
<td>6</td>
<td>42</td>
</tr>
</tbody>
</table>

**Determine whether the ratios are equivalent. Explain.**

10. 18 trucks to 4 cars, so 9 for every 2 people

11. $6 for every 10 people

12. 33 dinners to 6 packages, so 11 dinners to 2 packages

13. Engines: A four-cylinder engine produces a maximum of 110 horsepower. A six-cylinder engine produces a maximum of 180 horsepower. Do these engines have an equivalent horsepower-to-cylinder ratio? Justify your answer.

14. Analyze Tables For Exercises 14 and 15, use the information in the table that shows the crop statistics for three farms.

<table>
<thead>
<tr>
<th>Farm</th>
<th>Acres of Soybeans</th>
<th>Acres of Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>585</td>
<td>225</td>
</tr>
<tr>
<td>B</td>
<td>2,990</td>
<td>1,150</td>
</tr>
<tr>
<td>C</td>
<td>1,120</td>
<td>400</td>
</tr>
</tbody>
</table>

15. Which farm has the highest soybeans-to-corn ratio? Justify your answer. Farm B's soybeans-to-corn ratio is $\frac{14}{5}$. This is a larger ratio than $\frac{13}{5}$.

### Word Problem Practice

**Ratios**

1. **Elections** In an election for sheriff, 210 people voted. If there were 1,260 possible voters, write a ratio to compare the number of people who voted to the number of possible voters.

   \[
   \frac{210}{1,260} = \frac{7}{42} = \frac{1}{6}
   \]

2. **Dental Care** Tam surveyed 60 dentists and found that 48 favored the use of fluoride toothpaste. Write a ratio to compare the number of dentists favoring the use of a fluoride toothpaste to all dentists surveyed.

   \[
   \frac{48}{60} = \frac{4}{5}
   \]

3. **E-mail** One morning, Mirna counted 15 junk e-mails out of 21 e-mails in her inbox. Write a ratio comparing the number of junk e-mails to the total number of e-mails.

   \[
   \frac{15}{21} = \frac{5}{7}
   \]

4. **Surfing** One evening at his local surf spot, Jeff counted 28 surfers in the water. Among those, he counted 21 that had hoods on their wetsuits. Write a ratio comparing the number of surfers with hoods to the total number of surfers.

   \[
   \frac{21}{28} = \frac{3}{4}
   \]

5. **Music** A music company signed 12 new artists to its label in 2002. Out of the 12, 10 artists have hit songs. Write a ratio to compare the number of artists with hit songs to the total number of artists signed in 2002.

   \[
   \frac{10}{12} = \frac{5}{6}
   \]

6. **Baseball** Nate had 26 hits at 50 times at bat last season. Write a ratio to compare the number of hits to the number of times at bat.

   \[
   \frac{26}{50} = \frac{13}{25}
   \]

7. **Baseball** In baseball, David has 10 hits out of 14 at bats. Adam has 15 hits out of 21 at bats. For each player, write a ratio that represents his total number of hits out of times at bat. Are these ratios equivalent? 10:14 and 15:21; yes

8. **Driving** Sarah can drive 198 miles on 11 gallons of gasoline. On 6 gallons of gasoline, Rachel can travel 118 miles. Write a ratio that compares miles traveled per gallon of gasoline for each car. Do the cars get the same mileage? 198:11 and 138:6; no
Lesson Reading Guide

Rates

Get Ready for the Lesson

Do the Mini Lab at the top of page 287 in your textbook. Write your answers below.

1. Count the number of words that each of you read.
   See students' work.
2. Write the ratio number of words to number of minutes as a fraction.
   See students' work.
3. Simplify the fractions by dividing the numerator and the denominator by 2. See students' work.

Read the Lesson

4. A rate is a special kind of ratio. What makes it special? A rate is a ratio that compares two quantities with different kinds of units.

5. Describe what makes a rate different from a unit rate. Give an example of a rate and its equivalent unit rate. Sample answer: A unit rate is a rate that has a denominator of 1 unit. For example, $1.98 s CAD for 2 cans of soda = 0.99 s CAD for 1 can of soda.

6. Write the ratios in words for each unit rate abbreviation.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>m/s</td>
<td>number of meters</td>
</tr>
<tr>
<td>ft/s</td>
<td>number of feet</td>
</tr>
<tr>
<td>m/1/h (mph)</td>
<td>number of miles</td>
</tr>
<tr>
<td>m/1/gal (mpg)</td>
<td>number of miles</td>
</tr>
</tbody>
</table>

Remember What You Learned

7. Go to a food store or find several different newspaper food advertisements. Compare prices for several different sizes of the same product, or compare prices for similar sizes of different brands of the same product. Which size or which brand costs the least per unit? Report your results to the class. See students' work.
Lesson 6–2

Skills Practice

Rates

Find each unit rate. Round to the nearest hundredth if necessary.

1. $112 in 8 hours $14 per h

2. 150 miles in 6 gallons 25 mi per gal

3. 49 points in 7 games 7 points per game

4. 105 students in 3 classes 35 students per class

5. 120 problems in 5 hours 24 problems per h

6. 3 accidents in 12 months 0.25 accident per mo

7. 6 eggs in 7 days 0.86 egg per day

8. 8 batteries in 3 months 2.67 batteries per mo

9. 122 patients in 4 weeks 30.5 patients per wk

10. 51 gallons in 14 minutes 3.64 gal per min

11. $8.43 for 3 pounds $2.81 per lb

12. 357 miles in 6.3 hours 56.67 mi per hr

13. 15 pounds in 6 weeks 2.5 lb per wk

14. 8 commercials in 15 minutes 0.53 commercial per min

15. 25 letters in 4 days 6.25 letters per day

16. 5 breaks in 8 hours 0.63 break per h

17. 2 pay raises in 3 years 0.67 raise per yr

18. 8 glasses every 24 hours 0.33 glass per h

19. 19 errors in 6 months 0.32 error per mo

20. 3 trips in 14 months 0.21 trip per mo

21. 0.33 raise per yr

Choose the best unit price.

23. $4.99 for 6 cans or $7.99 for 10 cans $7.99 for 10 cans

24. $21.50 for 4 pounds of lunch meat or $15.10 for 3 pounds of lunch meat $15.10 for 3 pounds
6-2 Practice

Rates

Find each unit rate. Round to the nearest hundredth if necessary.

1. $11.49 for 3 packages

   \[ \frac{3.83}{1} \text{ per package} \]

2. 2,550 gallons in 30 days

   \[ \frac{85}{1} \text{ gallons per day} \]

3. 88 students for 4 classes

   \[ \frac{22}{1} \text{ students per class} \]

4. 15.6°F in 13 minutes

   \[ \frac{1.2}{1} \text{ °F per minute} \]

5. 175 Calories in 12 ounces

   \[ \frac{14.58}{1} \text{ C per oz} \]

6. 258.5 miles in 5.5 hours

   \[ \frac{47}{1} \text{ mi per h} \]

7. 549 vehicles on 9 acres

   \[ \frac{61}{1} \text{ vehicles per acre} \]

8. $920 for 40 hours

   \[ \frac{23}{1} \text{ per h} \]

9. 13 apples for 2 pies

   \[ \frac{6.5}{1} \text{ apples per pie} \]

10. Name Event Time (min)

    | Name  | Event    | Time (min) |
    |-------|----------|------------|
    | Theo  | 3K Run   | 9.6        |
    | Esteban | 5K Run  | 13.5       |
    | Tetsuo | 10K Run  | 31.9       |

11. MANUFACTURING A machinist can produce 114 parts in 6 minutes. At this rate, how many parts can the machinist produce in 15 minutes?

   285 parts

12. RECIPES A recipe that makes 8 jumbo blueberry muffins calls for 1 1/2 teaspoons of baking powder. How much baking powder is needed to make 3 dozen jumbo muffins?

   \[ \frac{6}{1} \text{ tsp} \]

13. $299 for 4 tires

    \[ \frac{74.75}{1} \text{ per tire} \]

    $299 ÷ 4 = $74.75

14. 3 yards of fabric for $13.47

    \[ \frac{4.49}{1} \text{ per yard} \]

    $13.47 ÷ 3 = $4.49

15. Which family uses about twice the amount of electricity per person than the other two families? Explain your reasoning.

    The Stiles family: The Melendez family uses 390 kwh per person, the Barton family uses 355 kwh per person, and the Stiles family uses 745 kwh per person.

16. Which family uses the least amount of water per person? Explain your reasoning.

    The Melendez family: The Melendez family uses 875 gal per person, the Barton family uses 1067 gal per person, and the Stiles family uses 1250 gal per person.
Enrichment

An Educated Consumer

Choosing a checking account is something that most people do at some point in their lives. Because checking accounts vary from institution to institution, and from one type of account to another, you will need to consider the options associated with each account before choosing one of them.

Suppose a bank offers two kinds of checking accounts.

Account A: a $0.20 charge for writing each check and no service charge

Account B: a $0.10 charge for writing each check and a monthly service charge of $1.50

1. Which account would cost less if a person were to write 10 checks in a month? Account A

2. Which account would cost less if a person were to write 20 checks in a month? Account B

3. Using the guess-and-check strategy, find the number of checks that would have to be written for the cost of Account A to equal the cost of Account B. What is that cost? It would take 15 checks; $3.00

4. Which account would cost less if a person were to write 250 checks in a year? By how much? Account B; $7.00

5. Diana Durbin wrote 300 checks in one year. Her total charge for the use of the account that year was $72.00. The bank charges $0.15 for writing one check and charges a fixed amount each month for the use of the account. What is that monthly service charge? $2.25

Lesson 6-3

Lesson Reading Guide

Measurement: Changing Customary Units

Get Ready for the Lesson

Read the introduction at the top of page 294 in your textbook. Write your answers below.

1. Complete the ratio table. The first two ratios are done for you.

<table>
<thead>
<tr>
<th>Tons</th>
<th>Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,000</td>
</tr>
<tr>
<td>4</td>
<td>8,000</td>
</tr>
<tr>
<td>5</td>
<td>10,000</td>
</tr>
<tr>
<td>8</td>
<td>16,000</td>
</tr>
</tbody>
</table>

2. Then graph the ordered pairs (tons, pounds) from the table. Label the horizontal axis Weight in Tons and the vertical axis Weight in Pounds. Connect the points. What do you notice about the graph of these data? Sample answer: the points seem to fall on a straight line.

Read the Lesson

3. To the right of each customary unit write its abbreviation.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>inch</td>
<td>in.</td>
</tr>
<tr>
<td>mile</td>
<td>mi</td>
</tr>
<tr>
<td>ton</td>
<td>T</td>
</tr>
<tr>
<td>pint</td>
<td>pt</td>
</tr>
<tr>
<td>foot</td>
<td>ft</td>
</tr>
<tr>
<td>ounce</td>
<td>oz</td>
</tr>
<tr>
<td>fluid ounce</td>
<td>fl oz</td>
</tr>
<tr>
<td>yard</td>
<td>yd</td>
</tr>
<tr>
<td>pound</td>
<td>lb</td>
</tr>
<tr>
<td>cup</td>
<td>c</td>
</tr>
<tr>
<td>gallon</td>
<td>gal</td>
</tr>
</tbody>
</table>

Complete each sentence.

4. To convert from larger units to smaller units, ________. multiply

5. To convert from smaller units to larger units, ________. divide

Remember What You Learned

6. Complete the table.

<table>
<thead>
<tr>
<th>Customary Units of Length</th>
<th>Customary Units of Weight</th>
<th>Customary Units of Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 foot = 12 inches</td>
<td>1 pound = 16 ounces</td>
<td>1 cup = 8 fluid ounces</td>
</tr>
<tr>
<td>1 yard = 3 feet</td>
<td>1 ton = 2,000 pounds</td>
<td>1 pint = 2 cups</td>
</tr>
<tr>
<td>1 mile = 5,280 feet</td>
<td>1 gallon = 4 quarts</td>
<td>1 quart = 2 pints</td>
</tr>
</tbody>
</table>
**6-3 Study Guide and Intervention**

**Measurement: Changing Customary Units**

<table>
<thead>
<tr>
<th>Customary Units</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td></td>
</tr>
<tr>
<td>1 foot (ft)</td>
<td>12 inches (in.)</td>
</tr>
<tr>
<td>1 yard (yd)</td>
<td>3 feet</td>
</tr>
<tr>
<td>1 mile (mi)</td>
<td>5,280 feet</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>1 pound (lb)</td>
<td>16 ounces (oz)</td>
</tr>
<tr>
<td>1 ton (T)</td>
<td>2,000 pounds</td>
</tr>
<tr>
<td>1 quart (qt)</td>
<td>2 pints</td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
</tr>
<tr>
<td>1 cup (c)</td>
<td>8 fluid ounces (fl oz)</td>
</tr>
</tbody>
</table>

**Example 1**

\[
5 \frac{1}{2} \text{ lb} = ? \text{ oz}
\]

To change from larger units to smaller units, multiply.

\[
5 \frac{1}{2} \times 16 = 88
\]

Since 1 pound is 16 ounces, multiply by 16.

\[
5 \frac{1}{2} \text{ pounds} = 88 \text{ ounces}
\]

**Example 2**

\[
28 \text{ fl oz} = ? \text{ c}
\]

To change from smaller units to larger units, divide.

\[
28 \div 8 = 3 \frac{1}{2}
\]

Since 8 fluid ounces are in 1 cup, divide by 8.

\[
28 \text{ fluid ounces} = 3 \frac{1}{2} \text{ cups}
\]

**Exercises**

**Complete.**

1. \(5 \text{ lb} = ? \text{ oz}\) 80
2. 48 in. = ___ ft 4
3. 6 yd = ___ ft 18
4. 7 qt = ___ pt 14
5. 8,000 lb = ___ T 4
6. 3\frac{1}{4} \text{ mi} = ___ ft 17,160
7. 4 c = ___ fl oz 32
8. 6 c = ___ pt 3
9. \(\frac{1}{2} \text{ gal} = ? \text{ qt}\) 2
10. 3 ft = ___ in. 36
11. 9 qt = ___ gal 2\frac{1}{4}
12. 30 fl oz = ___ c 3\frac{3}{4}
13. 6,864 ft = ___ mi 1\frac{3}{10}
14. 40 oz = ___ lb 2\frac{1}{2}
15. 9 pt = ___ c 18
16. 18 ft = ___ yd 6
17. 11 pt = ___ qt 5\frac{1}{2}
18. 2\frac{3}{4} \text{ T} = ___ lb 5,500
19. 24 fl oz = ___ c 3
20. 60 fl oz = ___ yd 20
21. 6,600 ft = ___ mi 1\frac{1}{4}
22. 7.5 T = ___ lb 15,000
23. 88 oz = ___ lb 5\frac{1}{2}
24. 70 qt = ___ gal 17\frac{1}{2}
### Measurement: Changing Customary Units

#### Complete.

1. \(4 \text{ c} = \_ \) \(\text{ fl oz}\) \hspace{1cm} 32
2. \(5 \text{ c} = \_ \) \(\text{ pt}\) \hspace{1cm} \(2 \frac{1}{2}\)
3. \(3 \text{ lb} = \_ \) \(\text{ oz}\) \hspace{1cm} 48
4. \(24 \text{ ft} = \_ \) \(\text{ yd}\) \hspace{1cm} 8
5. \(1\frac{1}{2} \text{ pt} = \_ \) \(\text{ c}\) \hspace{1cm} 3
6. \(64 \text{ oz} = \_ \) \(\text{ lb}\) \hspace{1cm} 4
7. \(4 \text{ mi} = \_ \) \(\text{ ft}\) \hspace{1cm} 21,120
8. \(2\frac{3}{4} \text{ mi} = \_ \) \(\text{ ft}\) \hspace{1cm} 14,520
9. \(3,000 \text{ lb} = \_ \) \(\text{T}\) \hspace{1cm} \(1\frac{1}{2}\)
10. \(5 \text{ gal} = \_ \) \(\text{ qt}\) \hspace{1cm} 20
11. \(3\frac{1}{4} \text{ qt} = \_ \) \(\text{ pt}\) \hspace{1cm} \(6\frac{1}{2}\)
12. \(4\frac{5}{8} \text{ T} = \_ \) \(\text{ lb}\) \hspace{1cm} 9,250
13. \(3\frac{1}{2} \text{ gal} = \_ \) \(\text{ qt}\) \hspace{1cm} 14
14. \(3\frac{1}{4} \text{ c} = \_ \) \(\text{ qt}\) \hspace{1cm} \(1\frac{3}{4}\)
15. \(40 \text{ fl oz} = \_ \) \(\text{ qt}\) \hspace{1cm} \(1\frac{1}{4}\)
16. \(660 \text{ yd} = \_ \) \(\text{ mi}\) \hspace{1cm} \(\frac{3}{8}\)
17. \(1.9 \text{ yd} = \_ \) \(\text{ in}\) \hspace{1cm} 68.4
18. \(2\frac{1}{4} \text{ T} = \_ \) \(\text{ oz}\) \hspace{1cm} 72,000

#### 19. SPORTS The track surrounding a football field is \(\frac{1}{4}\) mile long. How many yards long is the track? \(440 \text{ yd}\)

#### 20. STRAWBERRIES One quart of strawberries weighs about 2 pounds. About how many quarts of strawberries would weigh \(\frac{1}{4}\) ton? \(250 \text{ quarts}\)

#### ANALYZE GRAPHS For Exercises 21–23, use the graph shown.

21. What does an ordered pair from this graph represent? The \(x\)-value represents the number of inches, and the \(y\)-value represents the equivalent number of feet.

22. Write two sentences that describe the graph.
   Sample answer: The graph is a straight line. For each \(x\)-value increase of 12, the \(y\)-value increases by 1.

23. Use the graph to find the length in inches of a 1.5 foot iguana. Explain your reasoning.
   Sample answer: The \(x\)-value of the point on the line whose \(y\)-value is equal to 1.5 is 18, so 1.5 ft = 18 in.
Chapter 6

6-3  Enrichment

Changing Measurements with Factors of 1

Multiplying an expression by the number 1 does not change its value. This property of multiplication can be used to change measurements.

Let’s say you wanted to change 4.5 hours to seconds. Start by multiplying 4.5 by the number 1 written in the form $\frac{60 \text{ minutes}}{1 \text{ hour}}$. This first step changes 4.5 hours to minutes.

$$4.5 \text{ hours} \times \frac{60 \text{ minutes}}{1 \text{ hour}} = 270 \text{ minutes}$$

Now, multiply by the number 1 again. This time use the fact that $\frac{60 \text{ seconds}}{1 \text{ minute}}$ changes 4.5 hours to minutes.

$$270 \text{ minutes} \times \frac{60 \text{ seconds}}{1 \text{ minute}} = 16,200 \text{ seconds}$$

Complete by writing the last factor and the answer. You may need to use a table of measurements to find the factors.

1. Change 5 pints to fluid ounces.
   $$5 \text{ pints} \times \frac{2 \text{ cups}}{1 \text{ pint}} \times \frac{8 \text{ fluid ounces}}{1 \text{ cup}} = 80 \text{ fl oz}$$

2. Change 0.8 miles to inches.
   $$0.8 \text{ mile} \times \frac{5,280 \text{ feet}}{1 \text{ mile}} \times \frac{12 \text{ inches}}{1 \text{ foot}} = 50,688 \text{ in}.$$ 

3. Change 4 square yards to square inches.
   $$4 \text{ yd}^2 \times \frac{9 \text{ ft}^2}{1 \text{ yd}^2} \times \frac{144 \text{ in}^2}{1 \text{ ft}^2} = 5,184 \text{ in}^2$$

4. Change 12 bushels to pints.
   $$12 \text{ bushels} \times \frac{4 \text{ pecks}}{1 \text{ bushel}} \times \frac{8 \text{ quarts}}{1 \text{ peck}} \times \frac{2 \text{ pints}}{1 \text{ quart}} = 768 \text{ pt}$$

5. Change one-half of an acre to square inches.
   $$\frac{1}{2} \text{ acre} \times \frac{4,840 \text{ yd}^2}{1 \text{ acre}} \times \frac{9 \text{ ft}^2}{1 \text{ yd}^2} \times \frac{144 \text{ in}^2}{1 \text{ ft}^2} = 3,136,320 \text{ in}^2$$

Remember What You Learned

7. Name an everyday object that you can associate with each base metric unit of measure to help you remember what each unit represents.
   - Kilogram: Sample answer: the mass of a one liter bottle of water
   - Meter: Sample answer: the distance from the floor to a doorknob
   - Liter: Sample answer: the amount of soda in a standard bottle

Chapter 6

6-4  Lesson Reading Guide

Measurement: The Metric System

Get Ready for the Lesson

Complete the Mini Lab at the top of page 300 in your textbook. Write your answers below.

1. Select three other objects. Find and record the width of all five objects to the nearest millimeter and tenth of a centimeter. See students’ work.

2. Compare the measurements of the objects, and write a rule that describes how to convert from millimeters to centimeters.
   Divide by 10.

3. Measure the length of your classroom in meters. Make a conjecture about how to convert this measure to centimeters. Explain.
   Multiplication; there is a greater number of smaller units than larger units in a measure.

Read the Lesson

Complete each sentence.

4. To convert from centimeters to kilometers, first divide by _______ to convert to meters, then divide by _______ to convert to kilometers.
   100; 1,000

5. To convert from kiloliters to milliliters, first multiply by _______ to convert to liters, then multiply by _______ to convert to milliliters.
   1,000; 1,000

6. To convert from _______ to centigrams, multiply by 100. grams

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**Study Guide and Intervention**

**Measurement: The Metric System**

The table below is a summary of how to convert measures in the metric system.

<table>
<thead>
<tr>
<th>Larger Units → Smaller Units</th>
<th>Smaller Units → Larger Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units of Length (meter)</td>
<td></td>
</tr>
<tr>
<td>km to m – multiply by 1,000</td>
<td>m to cm – multiply by 100</td>
</tr>
<tr>
<td>m to mm – multiply by 1,000</td>
<td>cm to mm – multiply by 10</td>
</tr>
<tr>
<td>Units of Mass (kilogram)</td>
<td></td>
</tr>
<tr>
<td>kg to g – multiply by 1,000</td>
<td>g to kg – divide by 1,000</td>
</tr>
<tr>
<td>Units of Capacity (liter)</td>
<td></td>
</tr>
<tr>
<td>L to mL – multiply by 1,000</td>
<td>mL to L – divide by 1,000</td>
</tr>
</tbody>
</table>

**Examples**

1. **Complete.** 62 cm = __ m
   
   To convert from centimeters to meters, divide by 100.
   
   62 ÷ 100 = 0.62
   
   62 cm = 0.62 m

2. **Complete.** 2.6 kL = __ L
   
   To convert from kiloliters to liters, multiply by 1,000.
   
   2.6 × 1,000 = 2,600
   
   2.6 kL = 2,600 L

**Exercises**

1. 650 cm = __ m 6.5
2. 57 kg = __ g 57,000
3. 3.751 mg = __ g 0.003751
4. 8.2 L = __ mL 8,200
5. 2 L = __ kL 0.002
6. 892 mm = __ m 0.892
7. 121.4 kL = __ L 121,400
8. 0.72 cm = __ mm 7.2
9. 0.07 g = __ kg 0.00007
10. 5.2 g = __ mg 5,200
11. 3 cm = __ mm 30
12. 0.05 m = __ mm 50
13. 32 mm = __ cm 3.2
14. 96 m = __ km 0.096
15. 3.8 L = __ mL 3,800
16. 6.14 L = __ kL 0.00614
17. 3.5 m = __ km 0.0035
18. 750 km = __ m 750,000
19. 26.8 mm = __ cm 2.68
20. 75 m = __ km 0.075
21. 4.8 m = __ cm 480
22. 95 g = __ mg 95,000
23. 389 mm = __ m 0.389
24. 56 L = __ kL 0.056
25. 0.32 mm = __ cm 0.0032
26. 39.1 g = __ kg 0.0391

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6-4 Word Problem Practice

Measurement: The Metric System

1. **RUNNING** Each morning Carlos runs 1.5 kilometers. How many meters did he run? 1,500 m

2. **AVIATION** A helicopter was flying 800 meters above the ground. How many kilometers above the ground was it flying? 0.8 km

3. **SODA** A soda can contains 355 milliliters of liquid. How many liters of liquid does it contain? 0.355 L

4. **CONSTRUCTION** The ceilings of most classrooms are about 2.5 meters above the floor. How many centimeters high is the ceiling? 250 cm

5. **FENCING** Gerri’s garden is 1,270 centimeters around the edges. How many meters of fencing material does she need to enclose her garden? 12.7 m

6. **GARDENING** Mr. Chou’s lawn sprinkler sprays about 150 liters of water each hour. How many kiloliters of water does it spray? 0.15 kL

7. **NUTRITION** For 11- to 14-year-olds, the Recommended Dietary Allowance (RDA) for protein is about 60 grams daily. How many milligrams do they need daily? 60,000 mg

8. **MEASUREMENT** A measure of one pound is equivalent to about 454 grams. How many kilograms are in one pound? How many milligrams? 0.454 kg; 454,000 mg

Order each set of measures from least to greatest.

22. 0.06 km, 47 m, 15,800 cm

23. 891 g, 7,800 mg, 0.5 kg

24. 47 m, 0.06 km, 15,800 cm

25. **SPELLUNKING** The survey length of an underground cave is 0.914 kilometers. How many meters in length is this cave? 914 m

26. **FOOD** A 15-ounce box of granola contains 0.425 kilograms of cereal. How many grams of cereal are in the box of granola? 425 g
Lesson 6–5
NAME ________________________________________ DATE ______________ PERIOD _____

Lesson Reading Guide
Algebra: Solving Proportions

Get Ready for the Lesson
Read the introduction at the top of page 306 in your textbook.
Write your answers below.

1. Write the rate for each serving size of cereal.

2. Find the number of milligrams per cup for each serving size.

3. What symbol tells you that two ratios are equivalent?
   equals sign

4. What is true about the cross products of a proportion?
   They are equal.

5. How are cross products useful in identifying a proportion?
   Sample answer: Find the cross products. If the cross products are equal, then you know the equation is a proportion.

6. How are cross products useful in solving a proportion?
   Sample answer: If you know three parts of the proportion, you can solve for the unknown fourth part by cross-multiplying and then dividing both sides of the equation by the coefficient of the unknown.

Remember What You Learned
7. Explain what it means to solve a proportion. Use an example to show what you mean. Sample answer: Solving a proportion is similar to solving an equation, where one part of the proportion is unknown.

Example 1
Change 5 furlongs to meters.

5 \times 201.168 = 1,005.84
So, 5 furlongs is about 1,000 meters, or 1 kilometer.

Change each measurement to a metric measurement. Round each answer to the nearest tenth.

1. 10 yards
   9.1 m

2. 100 leagues
   482.8 km

3. 10 inches
   25.4 cm

4. 100 rods
   502.9 m

5. 1,000 miles
   25.4 mm

6. 10 feet
   3.0 m

7. 50 miles
   80.5 km

8. 50 furlongs
   10,058.4 m, or 10.1 km

9. 50 inches
   127.0 cm

10. 200 feet
    61.0 m

11. 200 miles
    321.9 km

12. 200 yards
    182.9 m
6-5  Skills Practice
Algebra: Solving Proportions

Determine if the quantities in each pair of ratios are proportional.

1. \( \frac{9}{5} = \frac{27}{15} \) yes  
2. \( \frac{16}{10} = \frac{24}{15} \) yes

3. \( \frac{6}{18} = \frac{9}{25} \) no  
4. \( \frac{42}{63} = \frac{28}{42} \) yes

5. \( \frac{11}{8} = \frac{13}{10} \) no  
6. \( \frac{22}{33} = \frac{12}{18} \) yes

7. \( \frac{14}{17} = \frac{29}{35} \) no  
8. \( \frac{36}{22} = \frac{30}{19} \) no

9. \( \frac{32}{48} = \frac{10}{15} \) yes  
10. \( \frac{320 \text{ mi}}{6 \text{ h}} = \frac{420 \text{ mi}}{8 \text{ h}} \) no

11. \( \frac{\$4.96}{8 \text{ oz}} = \frac{\$3.72}{6 \text{ oz}} \) yes  
12. \( \frac{25 \text{ mg}}{1.5 \text{ c}} = \frac{100 \text{ mg}}{6 \text{ c}} \) yes

Solve each proportion.

13. \( \frac{24}{13} = \frac{a}{26} \) 48  
14. \( \frac{18}{x} = \frac{3}{36} \) 216

15. \( \frac{3}{a} = \frac{5}{15} \) 9  
16. \( \frac{6.50}{6.5} = \frac{5}{5} \) 500

17. \( \frac{2.8}{4} = \frac{7}{q} \) 10  
18. \( \frac{c}{17} = 0.01 \frac{0.02}{8.5} \)

19. \( \frac{0.1}{8.2} = \frac{1.8}{b} \) 147.6  
20. \( \frac{300}{24} = \frac{18}{j} \) 1.44

21. \( \frac{4.2}{r} = \frac{8}{5} \) 2.625  
22. \( \frac{120}{75} = \frac{8}{m} \) 5
6-5  Word Problem Practice

Algebra: Solving Proportions

1. **COOKING**  Theo wants to use a cookie recipe that makes 36 cookies but he wants to reduce the number of cookies to 24. If the recipe specifies using 2 cups of sugar, how much sugar should he use? $\frac{1}{3}$ cup

2. **MEDICINE**  In order to determine her pulse rate, June’s nurse counted 18 beats in her pulse in 15 seconds. At this rate, how many beats would she have in 60 seconds? 72 beats

3. **LABOR**  Ed earned $112 for 8 hours of work. At this rate, how much will he earn for 40 hours of work? $560

4. **TRAVEL**  Rita traveled 1,250 miles in the first 3 days of her trip. At this rate, how long will it take her to travel 1,875 miles? 42 days

5. **CONDIMENTS**  A store sells a 9-ounce jar of mustard for $1.53 and a 15-ounce jar for $2.55. Is the cost of the mustard proportional to the number of ounces for each jar? Explain your reasoning.

   Yes; sample answer: $\frac{1.53}{9 oz} = \frac{0.17}{1 oz}$ and $\frac{2.55}{15 oz} = \frac{0.17}{1 oz}$. The unit rates are equal.

6. **MODELS**  An architect built a model of a 220-foot tall building he is designing. The model is 25 inches tall and 10 inches wide. How wide is the actual building? 88 ft

7. **SCIENCE**  There are 113.2 grams in 4 ounces of compound. How many grams are in 8 ounces of compound? 141.5 grams

8. **FURNITURE**  A furniture company has 15 trucks that make about 120 deliveries each day. The company is expanding and expects an additional 40 deliveries each day. Write and solve a proportion to find how many more trucks are needed so the truck-to-delivery ratio remains the same. 5 more trucks

9. **CHARITY**  Karthik spent $35 of his allowance and gave $5 to a charity. If the number of dollars he spends is proportional to the number of dollars he gives to a charity, how much of a $100 allowance will he give to a charity? $12.50

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Answers (Lesson 6-5)
**What Am I?**

Solve each proportion. Then, starting at the box marked with the heavy outline, draw an arrow to the adjacent box containing the variable with the least value. (You may move horizontally or vertically. You may use each box at most once.)

<table>
<thead>
<tr>
<th>Proportion</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x = \frac{4}{7}$</td>
<td>$x = \frac{2}{7}$</td>
</tr>
<tr>
<td>$0.7 \div 2 \times 3 = \frac{18}{3}$</td>
<td>$0.7 = \frac{18}{3}$</td>
</tr>
<tr>
<td>$0.3 \div 4 = \frac{8}{3} \div 2 \times 2$</td>
<td>$0.3 = \frac{8}{3} \div 2 \times 2$</td>
</tr>
<tr>
<td>$0.5 \div 7 = \frac{1}{14}$</td>
<td>$0.5 = \frac{1}{14}$</td>
</tr>
<tr>
<td>$\frac{5}{7} = \frac{4}{6}$</td>
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<tr>
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<td>$\frac{3}{3} = \frac{5}{5}$</td>
</tr>
<tr>
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<td>$\frac{10}{12} = \frac{4}{5}$</td>
</tr>
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<td>$\frac{15}{18} = \frac{5}{6}$</td>
</tr>
<tr>
<td>$\frac{3}{4} \times 2 = \frac{6}{8}$</td>
<td>$\frac{6}{8} = \frac{3}{4} \times 2$</td>
</tr>
<tr>
<td>$\frac{5}{6} \times 4 = \frac{10}{12}$</td>
<td>$\frac{10}{12} = \frac{5}{6} \times 4$</td>
</tr>
<tr>
<td>$\frac{5}{6} \times 5 = \frac{15}{18}$</td>
<td>$\frac{15}{18} = \frac{5}{6} \times 5$</td>
</tr>
<tr>
<td>$\frac{5}{6} \times 6 = \frac{15}{18}$</td>
<td>$\frac{15}{18} = \frac{5}{6} \times 6$</td>
</tr>
</tbody>
</table>

Now fill in the table below with the letters in the order in which you found them. Now you can say what I am.

**APRORPTION PUZZLE**

---

**Exercises**

Solve each proportion.

1. $\frac{3}{5} = \frac{15}{10}$
2. $\frac{2}{3} = \frac{10}{20}$
3. $\frac{5}{6} = \frac{20}{24}$
4. $\frac{3}{4} = \frac{3}{4}$
5. $\frac{2}{3}$
6. $\frac{2}{3} = \frac{2}{3}$
7. $\frac{2}{3} = \frac{2}{3}$
8. $\frac{2}{3} = \frac{2}{3}$
9. $\frac{2}{3} = \frac{2}{3}$
10. $\frac{2}{3} = \frac{2}{3}$
11. $\frac{2}{3} = \frac{2}{3}$
12. $\frac{2}{3} = \frac{2}{3}$

---

Example: Solve $x = \frac{8}{12}$.

First, subtract $\frac{2}{3}$ from each side to set the equation equal to zero.

So, the new equation is $\frac{2}{3} = \frac{2}{3} = 0$.

Now use the TI-83 Plus Equation Solver to solve for $x$.

Enter: `MATH 0 3 8 12` [SOLVE]

So, $x = 2$.

---

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Draw a diagram to solve.

1. **HOMEWORK** Shantel is studying for her History test. After 20 minutes, she is \( \frac{1}{4} \) of the way done. How much longer will she study? **60 minutes**

2. **RECIPES** Damon is making muffins. He has added \( \frac{3}{4} \) of the ingredients. If he has added 6 ingredients, how many more does he have to add to be finished? **2**

3. **TRAVEL** The Smithsons are going to Dallas, TX on vacation. They have traveled \( \frac{1}{3} \) of the total distance. If they have traveled 126 miles, how far is it from their house to Dallas? **378 miles**

4. **PHYSICS** A ball is dropped from 256 feet above the ground. It bounces up \( \frac{3}{4} \) as high as it fell. This is true for each successive bounce. What height will the ball reach on the third bounce? **4 feet**

5. **SCHOOL** Mrs. Wright says that \( \frac{2}{3} \) of her class has arrived for the day. If 10 students have arrived, how many students are in her class? **15**

6. **TRAVEL** Jeremy walked \( \frac{1}{2} \) of the way to school, ran \( \frac{1}{4} \) of the way to school, then rode with his best friend the rest of the way. If he walked 1.5 miles, how far did he ride with his friend? **3 miles**

---

**Example**

**CARNIVAL** Jim has to reach a target at a carnival game to win a prize. After 3 throws he has gone 75 feet, which is \( \frac{3}{4} \) of the way to the target. How far away is the target?

**Explore** We know that 75 feet is \( \frac{3}{4} \) of the way to the target.

**Plan** Draw a diagram to show the distance already thrown and the fraction it represents.

**Solve**

\[
\begin{array}{c|c|c|c}
\text{Begin} & \frac{1}{4} & \frac{1}{2} & \frac{3}{4} \\
\hline
\text{75 feet} & \text{Target} \\
\end{array}
\]

If \( \frac{3}{4} \) of the distance is 75 feet, then \( \frac{1}{4} \) of the distance is 25 feet. So, the missing \( \frac{1}{4} \) must be another 25 feet.

\[
\begin{array}{c|c|c|c|c}
\text{Begin} & +25 & +25 & \frac{3}{4} & \frac{1}{4} \\
\hline
+25 & +25 & \frac{7}{4} & \frac{7}{4} & 75 \text{ feet} & \text{Target} \\
\end{array}
\]

The total distance that Jim must throw to hit the target is 100 feet.

**Check** Since \( \frac{3}{4} \) of the total distance is 75 feet, the equation \( \frac{3}{4}x = 75 \) represents this problem. Solving, we get \( x = 100 \) feet. So, the solution checks.

---

**Exercises**

1. **SALES** Sharon wants to buy a new car. She has saved up $1,500, which is approximately \( \frac{1}{2} \) of the price of the car. How much does she need to save in order to buy the new car? **$7,500**

2. **TRAVEL** The Jones family has traveled 360 miles. They are \( \frac{4}{5} \) of the way to their destination. How far away is their destination? **450 miles**
1. MONEY Chantel has $125 left in her checking account after writing checks for $35, $22.50 and $16. What was her balance before she wrote the checks?
   $198.50

2. GEOMETRY Draw the next three figures in the pattern.

3. PIZZA Olivia has eaten \(\frac{1}{3}\) of the pizza. If she has eaten 3 pieces, how many pieces were originally in the pizza?
   9

4. EXERCISE Katlyn runs 2 miles after school each day and 3 miles on Saturday and 4 miles on Sunday. How many miles does she run during one week?
   17 miles

5. WORK Jefferson wants to work at least 25 hours this week. If he has already worked 22 hours, how many hours does he need to work on Saturday?
   3 hours

6. TRAVEL The bus to Washington has traveled \(\frac{5}{6}\) of the way there. If it has traveled 80 miles, how much farther does it have to go?
   16 miles

7. MUSEUMS The Art Club is planning on attending a museum. The admission cost is $10 for adults and $7.50 for students. If they plan on having 2 adults attend as chaperones and have $150 saved from a fundraiser, what is the maximum number of students who can attend?
   17 students

8. SPORTS Janean made 50 baskets during the week at practice. The table below shows when she made the baskets. How many baskets did she make on Friday?

<table>
<thead>
<tr>
<th>Day</th>
<th>Number of Baskets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>5</td>
</tr>
<tr>
<td>Tuesday</td>
<td>12</td>
</tr>
<tr>
<td>Wednesday</td>
<td>16</td>
</tr>
<tr>
<td>Thursday</td>
<td>7</td>
</tr>
<tr>
<td>Friday</td>
<td>?</td>
</tr>
</tbody>
</table>

   10 baskets

Use the draw a diagram strategy to solve Exercises 1 and 2.

1. ANTS An ant went 2 meters away from its nest searching for food. The next time, the ant went 3 meters away. Each successive time the ant leaves the nest to search for food, the ant travels the sum of the two previous times. How far will the ant travel on his fifth trip?
   13 meters

2. NECKLACES The center bead of a pearl necklace has a 16 millimeter diameter. Each successive bead in each direction is \(\frac{3}{4}\) the diameter of the previous one. Find the diameter of the beads that are three away from the center bead.
   \(6\frac{3}{4}\) mm

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

**PROBLEM-SOLVING STRATEGIES**
- Use the four-step plan.
- Work backward.
- Eliminate possibilities
- Draw a diagram.

3. TALENT SHOW At a talent show, 60% of the acts were singing. One-third of the remaining acts were instrumental. If 12 acts were instrumental, how many acts were in the talent show?
   90 acts

4. GEOMETRY Miss Greenwell is adding 4 feet to the length and width of her rectangular garden as shown in the diagram. How much additional area will the garden have?
   B
   A. 16 ft²
   B. 104 ft²
   C. 120 ft²
   D. 224 ft²

**Select the Operation**
For Exercises 5 and 6, select the appropriate operation(s) to solve the problems. Justify your selection(s) and solve the problem.

5. YARD SALE Myron has sold $18.50 worth of items at his yard sale. A neighbor bought two items and handed Myron a $10 bill. Myron returned $7.75 in change. How much has Myron now sold?
   Subtraction and addition;
   $18.50 - $7.75 = $2.25
   $18.50 + $2.25 = $20.75

6. COUNTRIES The table shows the total land area of five countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>8.5 million sq km</td>
</tr>
<tr>
<td>Canada</td>
<td>10.0 million sq km</td>
</tr>
<tr>
<td>China</td>
<td>9.6 million sq km</td>
</tr>
<tr>
<td>Russia</td>
<td>17.1 million sq km</td>
</tr>
<tr>
<td>United States</td>
<td>9.6 million sq km</td>
</tr>
</tbody>
</table>

   Estimate how much more total area Russia has than China. Write in scientific notation.
   \(17.1 - 9.6 = 7.5; 7.5 \times 10^6\) sq km

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   10 baskets

Solve each problem using any strategy you have learned.
**Exercise 1.3**

Find the distance from Patrick’s Point to Agate Beach.

On this map, each grid unit represents 50 yards. Find the distance from Patrick’s Point to Agate Beach.

**Example**

On this map, each grid unit represents 50 yards. Find the distance from Patrick’s Point to Agate Beach.

- **Scale**
  - Map: 1 unit
  - Actual: 50 yards

- **Cross products**
  - \[1 \times x = 50 \times 8\]
  - \[x = 400\]

It is 400 yards from Patrick’s Point to Agate Beach.

**Exercises**

Find the actual distance between each pair of cities. Round to the nearest tenth if necessary.

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**Remember What You Learned**

6. A scale drawing represents something that is too large or too small to be drawn or built at actual size. Similarly, a scale model can be used to represent something that is too large or built too small for an actual-size model. The scale gives the relationship between the drawing/model measure and the actual measure.

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**6-7 Practice**

**Scale Drawings**

For Exercises 1–3, use the diagram of a section of the art museum shown. Use a ruler to measure.

1. What is the actual length of the **Impressionism Art** room? 35 ft
2. Find the actual dimensions of the **Baroque Art** room. 40 ft by 25 ft
3. Find the scale factor for this blueprint. \(\frac{1}{240}\)

Find the length of each model on the scale drawing with the given scale.

4. **SKYSCRAPER** A model of a skyscraper is made using a scale of 1 inch:75 feet. What is the height of the actual building if the height of the model is 19.25 inches? 1,455 ft
5. **GEOGRAPHY** Salem and Eugene, Oregon, are 64 miles apart. If the distance on the map is 3.5 inches, find the scale of the map. 1 in. = 19.7 mi
6. **PYRAMIDS** The length of a side of the Great Pyramid of Khufu at Giza, Egypt, is 751 feet. If you were to make a model of the pyramid to display on your desk, which would be an appropriate scale: 1 in. = 10 ft or 1 in. = 500 ft? Explain your reasoning.

Sample answer: 1 in. = 500 ft; If using the 1 in. = 10 ft scale, the model would be about 75 inches in length. If using the 1 in. = 500 ft scale, the model would be about 1.5 feet, which would fit on the desk.

**Answers**

<table>
<thead>
<tr>
<th>Room</th>
<th>Drawing Length</th>
<th>Actual Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living Room</td>
<td>5 inches</td>
<td>15 ft</td>
</tr>
<tr>
<td>Dining Room</td>
<td>4 inches</td>
<td>12 ft</td>
</tr>
<tr>
<td>Kitchen</td>
<td>5 1/2 inches</td>
<td>16 1/2 ft</td>
</tr>
<tr>
<td>Laundry Room</td>
<td>3 1/2 inches</td>
<td>9 1/2 ft</td>
</tr>
<tr>
<td>Basement</td>
<td>10 inches</td>
<td>30 ft</td>
</tr>
<tr>
<td>Garage</td>
<td>8 1/3 inches</td>
<td>25 ft</td>
</tr>
</tbody>
</table>

**ARCHITECTURE**

As part of a city building refurbishment project, architects have constructed a scale model of several city buildings to present to the city commission for approval. The scale of the model is 1 inch = 9 feet.

7. The courthouse is the tallest building in the city. If it is 7 1/2 inches tall in the model, how tall is the actual building? 67 1/2 ft
8. The city commission would like to install new flagpoles that are each 45 feet tall. How tall are the flagpoles in the model? 5 in.
9. In the model, two of the flagpoles are 4 inches apart. How far apart will they be when they are installed? 36 ft
10. The model includes a new park in the center of the city. If the dimensions of the park in the model are 9 inches by 17 inches, what are the actual dimensions of the park? 81 ft by 153 ft
11. Find the scale factor. \(\frac{1}{108}\)
### Word Problem Practice

**Scale Drawings**

1. **Cars**
   A scale drawing of a car has a scale of 1 inch = 4 feet. The actual length of the car is 8 feet. What is the length on the scale drawing? 2 in.

2. **Models**
   A model ship is built to a scale of 1 centimeter = 5 meters. The length of the model is 30 centimeters. What is the length of the actual ship? 150 m

3. **Building**
   Jose wants to build a model of a 180-meter tall building. He will be using a scale of 1.5 centimeters = 3 meters. How tall will the model be? Round your answer to the nearest tenth. 36 cm

4. **Travel**
   Susan is driving to Mount Shasta. On her map, she is a distance of 2 1/2 miles away. The scale of the map is 1 inch = 50 miles. How far must Susan travel to reach her destination? 375 mi

5. **Maps**
   A map of Levi's property is being made with a scale of 3 centimeters = 3 meters. What is the scale factor? 1/150

6. **Landscaping**
   A pond is being dug according to plans that have a scale of 1 inch = 6.5 feet. The maximum distance across the pond is 9.75 inches on the plans. What will be the actual maximum distance across the pond? 63.75 ft

### Enrichment

**Scale Drawings**

Use the scale drawings of two different apartments to answer the questions.

![Scale drawings of two apartments](image)

1. Which apartment has the greater area? **Apartment B**

2. What is the difference in square feet between Apartment A and Apartment B? 48 ft²

3. How much more closet space is offered by Apartment B than Apartment A? 56 ft²

4. How much more bathroom space is offered by Apartment B than Apartment A? 12 ft²

5. A one-year lease for Apartment A costs $450 per month. A one-year lease for Apartment B costs $525 per month. Which apartment offers the greatest value in terms of the cost per square foot? **Apartment A**
### Lesson Reading Guide

#### Fractions, Decimals, and Percents

**Get Ready for the Lesson**

Read the introduction at the top of page 324 in your textbook. Write your answers below.

1. What percent of the teens said that the personal computer was the most important invention? **32%**
2. How is this percent written as a ratio? **32:100 or 32/100**
3. Simplify the ratio. **8/25**

**Read the Lesson**

4. Look at Example 1. Why is $\frac{16}{8}$ multiplied by $\frac{10}{10}$ to eliminate the decimal in the numerator?

5. Example 2 says to multiply by the reciprocal of 100. What is a reciprocal? Sample answer: the multiplicative inverse of another number, and when multiplied by the other number the product is 1.

6. How do you write 100 as a fraction? $\frac{100}{1}$

7. If the denominator is not a factor of 100, you can write fractions as percents by using a proportion. In Examples 3 and 4, why is the ratio $\frac{5}{100}$ used as part of the proportions? Sample answer: because you want to write the fraction as a percent, and to convert a fraction to a percent you want the denominator to be 100.

**Remember What You Learned**

8. Complete the following table of equivalent fractions. Look for patterns in each column. How do the percents increase? How do the fractions increase? Work with a partner. Figure out ways to remember the equivalents.

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Decimal</th>
<th>Percent</th>
<th>Fraction</th>
<th>Decimal</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{1}{2}$</td>
<td>0.5</td>
<td>50%</td>
<td>$\frac{3}{8}$</td>
<td>0.375</td>
<td>37.5%</td>
</tr>
<tr>
<td>$\frac{2}{3}$</td>
<td>0.666...</td>
<td>66.6%</td>
<td>$\frac{5}{8}$</td>
<td>0.625</td>
<td>62.5%</td>
</tr>
<tr>
<td>$\frac{1}{3}$</td>
<td>0.333...</td>
<td>33.3%</td>
<td>$\frac{7}{8}$</td>
<td>0.875</td>
<td>87.5%</td>
</tr>
</tbody>
</table>

---

**Exercises**

Use a TI-83/84 Plus graphing calculator to draw the polygons and their scale drawings. (Reset window so that Xmax = 20 and Ymax = 20.) Sketch the drawings. Label the vertices and coordinates of each polygon.

1. $A(1, 2); B(3, 4); C(4, 3)$ scale: 1 to 5

2. $A(4, 8); B(16, 16); C(12, 4)$ scale: 1 to 1

3. $A(1, 6); B(6, 4); C(4, 2)$ scale: 1 to 3

4. $A(1, 1); B(1, 3); C(3, 3); D(3, 1)$ scale: 1 to 1

5. $A(18, 9); B(12, 9); C(6, 18); D(21, 18)$ scale: 3 to 1

6. Why did the upper right-hand corner of Lesson 5 not show on the screen? The x-coordinate of a vertex is 21. This is greater than the Xmax setting.

7. Why did the upper right-hand corner of Exercise 5 not show on the screen? The x-coordinate of a vertex is 21. This is greater than the Xmax setting.
Write each percent as a fraction in simplest form.

1. 18% \( \frac{9}{50} \)
2. 67.5% \( \frac{27}{40} \)
3. 21.25% \( \frac{17}{80} \)
4. 87.5% \( \frac{7}{8} \)
5. 31\( \frac{1}{4} \)% \( \frac{5}{16} \)
6. 17.5% \( \frac{7}{40} \)
7. 18\( \frac{3}{4} \)% \( \frac{3}{16} \)
8. 68\( \frac{3}{4} \)% \( \frac{11}{16} \)
9. 7.5% \( \frac{3}{40} \)
10. 12.5% \( \frac{1}{8} \)
11. 36.75% \( \frac{147}{400} \)
12. 51\( \frac{1}{2} \)% \( \frac{11}{200} \)

Write each fraction as a percent. Round to the nearest hundredth if necessary.

13. \( \frac{3}{5} \) 60%
14. \( \frac{3}{8} \) 37.5%
15. \( \frac{2}{18} \) 11.11%
16. \( \frac{3}{16} \) 18.75%
17. \( \frac{7}{9} \) 77.78%
18. \( \frac{21}{50} \) 42%
19. \( \frac{1}{3} \) 33.33%
20. \( \frac{40}{42} \) 95.24%
21. \( \frac{7}{16} \) 43.75%
22. \( \frac{64}{125} \) 51.2%
23. \( \frac{11}{12} \) 91.67%
24. \( \frac{11}{15} \) 73.33%
Chapter 6

6-8 Practice

Fractions, Decimals, and Percents

Write each percent as a fraction in simplest form.
1. 37.5% \(\frac{3}{8}\)
2. 5.8% \(\frac{29}{500}\)
3. 43.75% \(\frac{7}{16}\)
4. 52.5% \(\frac{21}{40}\)
5. \(\frac{39}{75}\) 12\% \(\frac{1}{8}\)
6. \(\frac{32}{60}\) 24\% \(\frac{2}{8}\)
7. \(\frac{52}{50}\) 21\% \(\frac{87}{400}\)

Write each fraction as a percent. Round to the nearest hundredth if necessary.
9. \(\frac{13}{20}\) 65\%
10. \(\frac{9}{25}\) 36\%
11. \(\frac{7}{8}\) 87.5\%
12. \(\frac{39}{40}\) 97.5\%
13. \(\frac{5}{9}\) 55.56\%
14. \(\frac{6}{7}\) 85.71\%
15. \(\frac{49}{200}\) 24.5\%
16. \(\frac{4}{15}\) 26.67\%

Replace each \(\cdot\) with >, < or = to make a true statement.
17. \(\frac{3}{16}\) 24\% < 18. 0.75 • \(\frac{31}{40}\) = 19. 16\% • 0.016 >

Order each set of numbers from least to greatest.
20. 0.6, 23\%, \(0.07\), \(\frac{2}{3}\), \(\frac{0.07}{23}\), \(0.6\), \(\frac{2}{3}\)
21. \(\frac{3}{5}\), 0.37, \(\frac{1}{2}\), 0.4, \(\frac{4}{5}\), \(\frac{1}{2}\), 0.37, 0.4

22. SAVINGS Kayla has 14.5\% of her salary placed into an Individual Retirement Account. What fraction is this? \(\frac{29}{200}\)

23. INTERNET At home, 2 out of 5 people have access to broadband technology. What percent is this? 40\%

24. SPORTS A golfer made par on 13 of 18 holes. To the nearest tenth, on what percent of the holes did he make par? 72.2\%

ANALYZE TABLES For Exercises 25 and 26, use the table that shows the percent of households with the listed appliance.

<table>
<thead>
<tr>
<th>Appliance</th>
<th>Percent of Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerator</td>
<td>99.3%</td>
</tr>
<tr>
<td>Washing Machine</td>
<td>82.0%</td>
</tr>
<tr>
<td>Dryer</td>
<td>77.8%</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>56.0%</td>
</tr>
</tbody>
</table>

25. What fraction of households have a clothes dryer? \(\frac{389}{500}\)

26. Approximately 34 out of 67 households have a coffeemaker. Is this greater or less than the percent of households with a dishwasher? Explain. less than \(\frac{34}{67} = 50.7\%\)

INTERNET For Exercises 1–4, use the table. It shows the percents of online shopping purchases made by all Internet users and the percents made by Internet users over age 55.

<table>
<thead>
<tr>
<th>Most Popular Online Purchases</th>
<th>Internet Users</th>
<th>All Internet Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer software</td>
<td>43%</td>
<td>19%</td>
</tr>
<tr>
<td>Books</td>
<td>43%</td>
<td>21%</td>
</tr>
<tr>
<td>Computer hardware</td>
<td>24%</td>
<td>13%</td>
</tr>
<tr>
<td>Music CDs</td>
<td>29%</td>
<td>22%</td>
</tr>
<tr>
<td>Clothing</td>
<td>19%</td>
<td>8%</td>
</tr>
</tbody>
</table>

1. What fraction of Internet users over 55 bought clothing online? \(\frac{19}{100}\)
2. What fraction of all Internet users bought clothing online? \(\frac{2}{25}\)
3. What fraction of all Internet users bought music CDs online? \(\frac{11}{50}\)
4. Is the fraction of Internet users over 55 who bought books online greater or less than \(\frac{22}{50}\)? Explain. Less than; \(\frac{22}{50} = 44\%\), and 43\% is less than 44\%.

5. FOOTBALL In 2005, Indianapolis quarterback Peyton Manning completed 305 out of 453 passes. What was his pass completion percentage to the nearest tenth? 67.3\%

6. COMPUTERS In Joan’s math class, there are 20 computers and 32 students. What percent of students will be able to use a computer without sharing? 62.5\%

7. VEHICLES In the town of Nick, 5 out of 13 vehicles are trucks. What percent of the vehicles are trucks? Round to the nearest tenth. 38.5\%

8. DENTISTRY Dana has fillings in 4 of her 32 teeth. What percent of her teeth have fillings? 12.5\%
Shaded Regions

The fractions or percents listed below each represent one of the shaded regions.

Match each fraction or percent with the shaded region it represents.

1. $\frac{1}{2}$ d
2. $\frac{35}{64}$ i
3. $\frac{11}{16}$ h
4. 25% b
5. $\frac{3}{4}$ a
6. $62\frac{1}{2}$% g
7. $\frac{29}{64}$ f
8. 37.5% c
9. $\frac{7}{16}$ e

Example 1

Express 25% as a decimal and as a fraction.

Pressing the % key divides the preceding number by 100.

25% = 0.25

Example 2

Express 0.458 as a percent. Multiply by 100.

0.458 = 45.8%

Example 3

Express $\frac{3}{8}$ as a percent.

First express $\frac{3}{8}$ as a decimal. Then multiply by 100.

$\frac{3}{8}$ = 0.375

Reverse

So, $\frac{3}{8}$ = 37.5%

Caution: Your calculator follows the order of operations. It applies the % before it does multiplication or division.

Exercises

Express each percent as a decimal and as a fraction. Write fractions in simplest form.

1. 55% $\frac{11}{20}$
2. 86% $\frac{43}{50}$
3. 140% $1\frac{1}{2}$
4. 30.5% $0.305, \frac{61}{200}$
5. 250% $2.5 = 2\frac{1}{2}$
6. 0.8% $0.008 = \frac{1}{125}$

Express each fraction as a percent. Round to the nearest hundredth if necessary.

7. $\frac{1}{4}$ 75%
8. $\frac{5}{8}$ 62.5%
9. $\frac{16}{20}$ 80%
10. $\frac{7}{16}$ 43.75%
11. $\frac{1}{3}$ 33.33%
12. $\frac{9}{12}$ 75%
NAME ________________________ DATE ______________ PERIOD _____

Lesson Reading Guide

Percents Greater Than 100% and Percents Less Than 1%

1. What percent does Model 1 represent? 120%
2. What percent does Model 2 represent? 2\%\quad \frac{1}{5}
3. Shade grids to represent each percent.
   a. 150%
   b. 215%
   c. \frac{3}{4}

Read the Lesson

4. If you are converting from a percent to a fraction or mixed number and the percent is greater than 100%, is the result a fraction or a mixed number? Explain. a mixed number; Sample answer: If the percent is greater than 100%, after you move the decimal point, the resulting number will be greater than 1.
5. In converting between decimals and percents, when do you use multiplication? When do you use division? Use multiplication to write a decimal as a percent; use division to write a percent as a decimal.

Remember What You Learned

6. Have you ever heard a coach encourage his or her team to “Give it a 110%”? Describe what it means when a percent is greater than 100%. Describe what it means when a percent is less than 1%. See students’ work.

Examples

Write each percent as a decimal and as a mixed number or fraction in simplest form.
1. 280% \quad \frac{280}{100} \quad \text{Definition of percent} \quad 0.12% = \frac{0.12}{100} \quad \text{Definition of percent} \quad = 2.8 \quad \frac{28}{10}\quad = 0.0012 \quad \frac{1}{5} = 0.34\%

Write each decimal as a percent.
2. 2.17 \quad \frac{2.17}{100} \quad \text{Multiply by 100.} \quad 0.0034 = \frac{0.0034}{100} \quad \text{Multiply by 100.} \quad = 217\% \quad = 0.34\%

Exercises

Write each percent as a decimal and as a mixed number or fraction in simplest form.
1. 200% \quad 2. 750% \quad 3. 325%; \quad 3.25; \quad 3\frac{1}{4}
4. 0.3% \quad 0.003; \quad 0.8% \quad 0.008; \quad 1\frac{1}{125} \quad 6. 0.48% \quad 0.0048; \quad 0.625\%

Write each decimal as a percent.
7. 2.6 \quad 260% \quad 8. 19 \quad 1900% \quad 9. 5.14 \quad 514%
10. 0.008 \quad 0.8% \quad 11. 0.0014 \quad 0.14% \quad 12. 0.0067 \quad 0.67%
Skills Practice

**Percents Greater Than 100% and Percents Less Than 1%**

Write each percent as a decimal and as a mixed number or fraction in simplest form.

1. 900% \( \frac{9}{1} \)
2. 150% \( \frac{15}{1}; \frac{1}{2} \)
3. 675% \( \frac{675}{1000}; \frac{27}{40} \)
4. 245% \( \frac{245}{1000}; \frac{49}{200} \)
5. 120% \( \frac{12}{1}; \frac{1}{5} \)
6. 0.2% \( \frac{1}{500} \)
7. 0.08% \( \frac{1}{1250} \)
8. 0.12% \( \frac{1}{833}; \frac{3}{2500} \)
9. 0.35% \( \frac{1}{2857}; \frac{7}{2000} \)

Write each decimal as a percent.

10. 3.9 \( \frac{390}{1} \)
11. 81 \( \frac{8100}{1} \)
12. 25 \( \frac{2500}{1} \)
13. 6.75 \( \frac{675}{100} \)
14. 2.81 \( \frac{281}{100} \)
15. 0.001 \( \frac{1}{1000} \)
16. 0.0046 \( \frac{46}{10000} \)
17. 0.0069 \( \frac{69}{10000} \)
18. 0.0083 \( \frac{83}{10000} \)

Write each number as a percent.

19. \( \frac{61}{2} \) 650% 
20. \( \frac{2}{3} \) 250% 
21. \( \frac{5}{4} \) 525% 
22. \( \frac{1}{200} \) 0.5% 
23. \( \frac{2}{250} \) 0.8% 
24. \( \frac{3}{500} \) 0.6%

---

**Answers**

Write each percent as a decimal and as a mixed number or fraction in simplest form.

1. 225% \( \frac{225}{100}; \frac{9}{4} \)
2. 550% \( \frac{55}{1}; \frac{11}{2} \)
3. 300% \( \frac{3}{1} \)
4. 800% \( \frac{8}{1} \)
5. 0.8% \( \frac{1}{125}; \frac{0.008}{1} \)
6. 0.06% \( \frac{3}{5000}; \frac{0.0006}{1} \)
7. 0.45% \( \frac{9}{2000}; \frac{0.0045}{1} \)
8. 0.02% \( \frac{1}{5000}; \frac{0.0002}{1} \)

Write each decimal as a percent.

9. 7.2 \( \frac{720}{100} \)
10. 12 \( \frac{1200}{100} \)
11. 4.56 \( \frac{456}{100} \)
12. 1.04 \( \frac{104}{100} \)
13. 0.001 \( \frac{1}{1000} \)
14. 0.008 \( \frac{8}{1000} \)
15. 0.0078 \( \frac{78}{10000} \)
16. 0.0092 \( \frac{92}{10000} \)

Write each mixed number or fraction as a percent.

17. \( \frac{1}{2} \) 450% 
18. \( \frac{8}{4} \) 225% 
19. \( \frac{1}{250} \) 0.4% 
20. \( \frac{3}{400} \) 0.75%

Write each percent as a decimal.

21. \( \frac{3}{8} \) 0.375
22. \( \frac{7}{10} \) 0.7
23. \( \frac{17}{20} \) 0.85
24. \( \frac{13}{25} \) 0.52

**ATMOSPHERE** Helium gas accounts for less than 0.01% of Earth's atmospheric gases. Write this percent as a decimal and as a mixed number or fraction in simplest form. Then interpret its meaning.

0.001; \( \frac{1}{10000}; \frac{1}{10000} \); So, less than 0.0001 of Earth's atmospheric gases is Helium.

**STOCKS** The stock of a particular company skyrocketed 1,550% in one month period. Write this percent as a decimal and as a mixed number. Then interpret its meaning:

15.5; 15 \( \frac{5}{10} \); The value of the stock is 15.5 times more than the value from a month before.

**ANALYZE TABLES** For Exercises 27 and 28, refer to the table shown.

<table>
<thead>
<tr>
<th>Planet</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.35</td>
</tr>
<tr>
<td>Venus</td>
<td>0.87</td>
</tr>
<tr>
<td>Earth</td>
<td>0.92</td>
</tr>
<tr>
<td>Mars</td>
<td>0.49</td>
</tr>
</tbody>
</table>

Source: motivate.maths.org

27. Write the percent of Venus's diameter compared to the Sun's diameter as a decimal. 0.0087

28. Which planet's diameter is approximately \( \frac{1}{200} \) of the sun's diameter? Explain.

Mars; sample answer: \( \frac{1}{200} \approx 0.5\% \) and \( 0.49\% = 0.5\% \), so \( 0.49\% \approx \frac{1}{200} \).
### Word Problem Practice

#### Percents Greater Than 100% and Percents Less Than 1%

1. **INTERNET** Kilroy found that 0.70% of the documents from the Internet had names that ended in ".txt" or ".text". Write this percent as a decimal and as a fraction.
   - Decimal: 0.007
   - Fraction: \( \frac{7}{1000} \)

2. **BUSINESS** Jocelyn expects her new software company to increase its sales next year \( \frac{23}{8} \) times their present value. Write this increase as a percent.
   - 287.5%

3. **UTILITIES** City records showed that 0.8% of new homes had no access to electricity. Write this percent as a decimal and as a fraction in simplest form.
   - Decimal: 0.008
   - Fraction: \( \frac{2}{250} \)

4. **PETS** Berto got a puppy 8 weeks ago. In this time, the puppy’s weight increased 215%. Write this percent as a decimal and as a fraction.
   - Decimal: 2.15
   - Fraction: \( \frac{23}{10} \)

5. **MANUFACTURING** The Quality Assurance department at a gear company found that there were 3 defective gears for every 675 produced. Write this as a fraction and as a percent. Round to the nearest hundredth.
   - Fraction: \( \frac{1}{225} \)
   - Percent: 0.44%

6. **MEDICINE** Estelle’s pharmacist said that the medicine Estelle was taking contained no more than \( \frac{1}{500} \) gram of impurities per gram of total weight. Write this fraction as a percent.
   - Percent: 0.2%

### Enrichment

#### Juan de la Cierva

Helicopters became widely used in the early 1950s. However, did you know that a similar aircraft was developed in Spain nearly thirty years earlier? The inventor was Juan de la Cierva (1888–1938), and for many years his aircraft were used in rescue work. The modern helicopter is faster and more versatile, but it retains many features of Cierva’s design.

Fill in the blanks below to find what Cierva called his aircraft. On the line next to the decimal, fraction, or mixed number, write the letter matching the answer. If you have found the percents correctly, the letters read downward will spell out the name of the aircraft.

1. \( \frac{3}{2} \) \( \frac{3}{100} \) \( \frac{1}{200} \) \( \frac{3}{2} \)
   - Letters: \( A \) \( U \) \( R \) \( O \)
   - Percentages: 150% 0.029% 0.5% 0.6%
# Chapter 6 Assessment Answer Key

<table>
<thead>
<tr>
<th>Quiz 1 (Lessons 6-1 and 6-2)</th>
<th>Quiz 3 (Lessons 6-5, 6-6 and 6-7)</th>
<th>Mid-Chapter Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Page 67</strong></td>
<td><strong>Page 68</strong></td>
<td><strong>Page 69</strong></td>
</tr>
<tr>
<td>1. ( \frac{6}{1} )</td>
<td>1. ( \frac{5}{2} )</td>
<td>1. C</td>
</tr>
<tr>
<td>2. ( \frac{3}{13} )</td>
<td>2. 2</td>
<td>2. F</td>
</tr>
<tr>
<td>3. 11.61 m per sec</td>
<td>3. 150 mi</td>
<td>3. C</td>
</tr>
<tr>
<td>4. 8 lbs per dog</td>
<td>5. 437.5 mi</td>
<td>4. H</td>
</tr>
<tr>
<td>5. B</td>
<td></td>
<td>5. A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quiz 2 (Lessons 6-3 and 6-4)</th>
<th>Quiz 4 (Lessons 6-8 and 6-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Page 67</strong></td>
<td><strong>Page 68</strong></td>
</tr>
<tr>
<td>1. 85,000</td>
<td>1. ( \frac{31}{200} )</td>
</tr>
<tr>
<td>2. 0.16</td>
<td>2. ( \frac{12}{25} )</td>
</tr>
<tr>
<td>3. 4.3</td>
<td>3. 35%</td>
</tr>
<tr>
<td>4. 54</td>
<td>4. 37.5%</td>
</tr>
<tr>
<td>5. ( 3\frac{1}{2} )</td>
<td>5. 3</td>
</tr>
<tr>
<td>6. 56</td>
<td>6. 0.005; ( \frac{1}{200} )</td>
</tr>
<tr>
<td>7. ( 2\frac{2}{3} )</td>
<td>7. 750%</td>
</tr>
<tr>
<td>8. 2,640</td>
<td>8. 6.8%</td>
</tr>
<tr>
<td></td>
<td>9. 275%</td>
</tr>
<tr>
<td></td>
<td>10. 0.75%</td>
</tr>
</tbody>
</table>

11. $1.30 per pencil
12. 32 books per sq ft
13. 31
Chapter 6 Assessment Answer Key

<table>
<thead>
<tr>
<th>Vocabulary Test</th>
<th>Form 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page 70</td>
<td>Page 71</td>
</tr>
<tr>
<td>1. <strong><strong>ounce</strong></strong></td>
<td>1. <em>B</em></td>
</tr>
<tr>
<td>2. <strong><strong>equivalent</strong></strong></td>
<td>2. <em>J</em></td>
</tr>
<tr>
<td>3. <strong><strong>equivalent ratios</strong></strong></td>
<td>3. <em>B</em></td>
</tr>
<tr>
<td>4. <strong><strong>scale</strong></strong></td>
<td>4. <em>G</em></td>
</tr>
<tr>
<td>5. <strong><strong>liter</strong></strong></td>
<td>5. <em>B</em></td>
</tr>
<tr>
<td>6. <strong><strong>cross products</strong></strong></td>
<td>6. <em>J</em></td>
</tr>
<tr>
<td>7. <strong><strong>liter</strong></strong></td>
<td>7. <em>B</em></td>
</tr>
<tr>
<td>8. <strong><strong>pint</strong></strong></td>
<td>8. <em>G</em></td>
</tr>
<tr>
<td>9. <strong><strong>scale</strong></strong></td>
<td>9. <em>A</em></td>
</tr>
<tr>
<td>10. <strong><strong>thousands</strong></strong></td>
<td>10. <em>H</em></td>
</tr>
<tr>
<td>Sample answer: the product of the numerator of one ratio and the denominator of the other ratio in a proportion</td>
<td>11. <em>B</em></td>
</tr>
<tr>
<td>Sample answer: a drawing that represents something that is too large or too small to be drawn at actual size</td>
<td>12. <em>G</em></td>
</tr>
<tr>
<td>13. <em>C</em></td>
<td></td>
</tr>
<tr>
<td>14. <em>J</em></td>
<td></td>
</tr>
<tr>
<td>15. <em>A</em></td>
<td></td>
</tr>
<tr>
<td>16. <em>G</em></td>
<td></td>
</tr>
<tr>
<td>17. <em>D</em></td>
<td></td>
</tr>
<tr>
<td>18. <em>G</em></td>
<td></td>
</tr>
<tr>
<td>19. <em>A</em></td>
<td></td>
</tr>
<tr>
<td>20. <em>F</em></td>
<td></td>
</tr>
<tr>
<td>B: <strong><strong>40%</strong></strong></td>
<td></td>
</tr>
</tbody>
</table>

Glencoe California Mathematics, Grade 6
<table>
<thead>
<tr>
<th>Form 2A</th>
<th>Page 73</th>
<th>Form 2B</th>
<th>Page 76</th>
</tr>
</thead>
</table>

B: 35%  B: 43.75%
Chapter 6 Assessment Answer Key

Form 2C
Page 77

1. 40 oz

2. \(\frac{2}{3}\)

3. \(\frac{1}{10}\)

4. yes; \(\frac{30}{65} = \frac{6}{13}\)

5. no; \(\frac{3}{5} \neq \frac{5}{7}\)

6. $0.15 per lollipop

7. 59 gal per min

8. $0.51 per lb

9. 25 km

10. These rates are not equivalent.

11. 15.6

12. 96

13. 2.5

14. 2\(\frac{1}{3}\) in.; \(\frac{1}{72}\)

15. 32 cm; \(\frac{1}{125}\)

16. 10 mi by 22.5 mi

17. \(\frac{3}{32}\)

18. \(\frac{27}{40}\)

19. 58.75%

20. 22.73%

21. 1.75; 1\(\frac{3}{4}\)

22. 0.0065; \(\frac{13}{2000}\)

23. 670%

24. 0.2%

25. 0.6%

26. 825%

27. $2.97

28. 48

29. 4\(\frac{1}{2}\)

30. 56

31. 0.067

32. 140

33. 2.9

B: 1,035 students
1. 12 L

2. \( \frac{3}{8} \)

3. \( \frac{1}{4} \)

4. no; \( \frac{5}{11} \neq \frac{11}{5} \)

5. yes; \( \frac{25}{40} = \frac{5}{8} \)

6. $0.53 per lb

7. 3 stickers per student

8. 4.67 gal per turtle

9. 30 km

10. Yes; \( \frac{6 \text{ bottles}}{4 \text{ dollars}} = \frac{1.5 \text{ bottles}}{1 \text{ dollar}} \) and \( \frac{18 \text{ bottles}}{12 \text{ dollars}} = \frac{1.5 \text{ bottles}}{1 \text{ dollar}} \)

These rates are equivalent.

11. 8.75

12. 8.4

13. 10

14. \( \frac{2\frac{2}{5}}{5} \text{ in.}; \frac{1}{60} \)

15. \( \frac{8 \text{ cm}}{250} \)

16. 30 mi by 45 mi

17. \( \frac{1}{9} \)

18. \( \frac{7}{16} \)

19. 32.5%

20. 18.18%

21. 5.5; \( 5\frac{1}{2} \)

22. 0.0032; \( \frac{2}{625} \)

23. 940%

24. 0.8%

25. 0.75%

26. 675%

27. $3.96

28. 56

29. 6.5

30. 88

31. 480

32. 13,800

33. 500

B: 936 students
Chapter 6 Assessment Answer Key

Form 3
Page 81

1. 10 oz

2. \(\frac{3}{5}\)

3. \(\frac{20}{3}\)

4. yes; \(\frac{16}{24} = \frac{2}{3}\)

5. no; \(\frac{9}{16} \neq \frac{3}{4}\)

6. 9.6 mi per h

7. $0.70 per lb

8. 9.67 gal per min

9. 6 km

10. These rates are not equivalent.

11. 2.25

12. 6.88

13. 22

14. \(\frac{29\frac{1}{11}}{1\frac{1}{6}}\)

15. 18 in.; \(\frac{1}{4}\)

Page 82

16. 40 mi by 60 mi

17. \(\frac{11}{200}\)

18. \(\frac{13}{16}\)

19. 38.75%

20. 58.33%

21. 2.95; \(\frac{19}{20}\)

22. 0.0008; \(\frac{1}{1,250}\)

23. 2,900%

24. 0.44%

25. 237.5%

26. 0.2%

27. $44.25

28. 62

29. \(\frac{52}{3}\)

30. 7,000

31. \(\frac{1}{2}\)

32. 32

33. \(\frac{3}{4}\)

B: 476 students
### Chapter 6 Assessment Answer Key

**Page 83, Extended-Response Test**

**Scoring Rubric**

<table>
<thead>
<tr>
<th>Level</th>
<th>Specific Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4</strong></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><strong>3</strong></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><strong>2</strong></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><strong>1</strong></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><strong>0</strong></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 6 Assessment Answer Key

Page 83, Extended-Response Test
Sample Answers

In addition to the scoring rubric found on page A35, the following sample answers may be used as guidance in evaluating extended-response assessment items.

1. Sample answers: 4:9 and 12:27; \( \frac{3}{8} \) and \( \frac{9}{24} \); 3:5 and 12:20

2. A proportion is an equation that shows that two ratios are equivalent.

3. (a) \( \frac{2}{3} = \frac{\bigcirc \bigcirc \bigcirc}{\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc} \)

(b) \( \frac{\bigcirc \bigcirc \bigcirc}{\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc} = \frac{1}{2} \)

(c) \( \frac{3}{4} = \frac{\bigcirc \bigcirc \bigcirc \bigcirc}{\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc} \)

4. \begin{align*}
32 \text{ mm} \\
64 \text{ mm}
\end{align*}
Chapter 6 Assessment Answer Key

Standardized Test Practice
Page 84

1. ◯ ◯ ◯ ◯

2. ● ● ● ●

3. ◯ ◯ ● ◯

4. ◯ ◯ ● ◯

5. ◯ ◯ ● ◯

6. ◯ ◯ ● ●

7. ● ● ● ◯

8. ● ● ● ●

9. ● ● ● ◯

10. ◯ ◯ ● ●

Page 85

11. ◯ ◯ ◯ ●

12. ◯ ◯ ● ●

13. ● ● ◯ ◯

14. ◯ ◯ ● ●

15. ◯ ◯ ● ●

16. ◯ ◯ ● ●

17. ◯ ◯ ◯ ●
18. 

19. $-17$

20. $45$

21. $0.81$

22. $12$ mi per h

23. $\frac{1}{3}$

24. $\frac{31}{200}$

25a. $17$ packages per hour

Greater than; $\frac{128$ packages}{6 hours} $ = $21\frac{1}{3}$ packages per hour. This is greater than $17$ packages per hour per hour.

25b. hour.