In Grade 6, you learned about unit rates. Take a look at this problem.

Jana is training for a triathlon that includes a 112-mile bike ride. Today, she rode her bike 12 miles in 45 minutes. What is Jana’s rate in miles per hour?

12 miles

45 minutes

Explore It

Use the math you already know to solve the problem.

- If Jana biked at a constant rate, how many miles did she bike in the first 15 minutes? _________
- At the same rate, how many miles did she bike in the next 15 minutes? _________
- At the same rate, how many miles did she bike in the last 15 minutes? _________
- How many more minutes would Jana need to bike to total one hour? _________
- At the same rate, how many miles would she bike in that amount of time? _________
- Explain how you could find the number of miles Jana bikes in one hour.

________________________________________________________________________
________________________________________________________________________
Find Out More

The number of miles Jana bikes in one hour is a **unit rate**. A unit rate compares two quantities where one of the quantities is 1. A unit rate tells you how many units of the first quantity correspond to one unit of the second quantity.

The units in this problem are miles and hours. The problem tells us that Jana bikes 12 miles in 45 minutes. That’s the same thing as 12 miles in \( \frac{3}{4} \) hour.

\[
\text{number of miles} = \frac{12}{\frac{3}{4}}
\]

The fraction \( \frac{12}{\frac{3}{4}} \) is a **complex fraction**. A complex fraction is a fraction where either the numerator is a fraction, the denominator is a fraction, or both the numerator and the denominator are fractions. You can simplify a complex fraction by dividing, just as you would do with whole numbers.

The fraction bar represents division, so you can think of \( \frac{6 \text{ miles}}{2 \text{ hours}} \) as \( 6 \div 2 = 3 \) miles per hour.

You can think about \( \frac{12 \text{ miles}}{\frac{3}{4} \text{ hour}} \) in the same way.

\[
\frac{12}{\frac{3}{4}} = 12 \div \frac{3}{4}
\]

\[
= 12 \times \frac{4}{3}
\]

\[
= \frac{48}{3} = 16 \text{ miles per hour}
\]

The unit rate is 16. The number of miles Jana bikes is 16 times the number of hours.

Reflect

1. On another training ride, Jana bikes 15 miles in 50 minutes. Explain how you could find the number of miles she bikes in 1 hour.
Read the problem below. Then explore different ways to understand how to find a unit rate.

Max’s favorite recipe for oatmeal raisin cookies makes 48 servings. He wants to make some cookies but only has one egg. Max has to adjust the amounts of the other ingredients. How much flour will he need?

<table>
<thead>
<tr>
<th>Oatmeal Raisin Cookies</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 cup butter</td>
</tr>
<tr>
<td>2 eggs</td>
</tr>
<tr>
<td>1 1/2 cups flour</td>
</tr>
</tbody>
</table>

Model It

You can draw a double number line to show the relationship described in the problem.

The units you need to compare are cups of flour and eggs.

Start both number lines at 0.

Line up 1/2 cups of flour with 2 eggs.

You need to find the unit rate, the number of cups of flour needed for 1 egg.

The point for one egg is halfway between 0 and 2. Draw a line halfway between 0 and 2.

The number that lines up with 1 is halfway between 0 and 1 1/2.
Connect It

Now you will see how to solve the problem from the previous page by writing a ratio.

2 Why do you need to find the number that is halfway between 0 and 1 \( \frac{1}{2} \)?

3 How could you find the number that is between 0 and 1 \( \frac{1}{2} \)?

4 How many cups of flour does Max need to use if he has just 1 egg? Show your work.

5 Write the ratio that compares \( 1 \frac{1}{2} \) cups of flour to 2 eggs.

\[
\frac{\text{cups of flour}}{\text{eggs}} = \frac{3}{2}
\]

6 Write and simplify a division expression to find the number of cups of flour Max needs to use if he has just 1 egg.

7 The unit rate is ______. The number of cups of flour is ______ times the number of eggs.

8 Explain how to find a unit rate.

Try It

Use what you just learned about finding a unit rate to solve these problems. Show your work on a separate sheet of paper.

Use the information in the recipe on the previous page.

9 If Max has only one egg, how much butter will he need? ____________

10 If Max has only one cup of flour, how much vanilla will he need? ____________
Read the problem below. Then explore different ways to understand how to find and compare unit rates.

José’s mother is trying to decide whether or not she should buy a 12-ounce package of coffee on sale for $7.50. She knows that she can buy the same coffee for $9.00 per pound. Which is the better buy?

**Model It**

You can draw a double number line to show the relationship described in the problem.

To find the better buy, compare the unit rate of each option.

The problem gives you one unit rate: $9.00 per pound. To compare unit rates, the units you use must be the same. So, find the weight of the other coffee in pounds.

There are 16 ounces in 1 pound, so 12 ounces is $\frac{12}{16}$ or $\frac{3}{4}$ pound.

You can write $7.50 using fractions. $7.50 is the same as $7 \frac{1}{2}$.

Find the cost for each quarter-pound of coffee. Then find the unit cost.
Connect It

Now you will see how to use a ratio to solve the problem.

11 The top number line is divided into 3 equal parts from 0 to $7\frac{1}{2}$, and the bottom number line is divided into 3 equal parts from 0 to $\frac{3}{4}$. How can you use this to find the cost of 1 pound of coffee?

12 Write the ratio that compares $7\frac{1}{2}$ dollars to $\frac{3}{4}$ pound of coffee. $\frac{\text{dollars}}{\text{pounds of coffee}} = \underline{\phantom{0}}$

13 Write and simplify a division expression to find the cost of 1 pound of coffee.

14 Which is the better buy, 12 ounces for $7.50 or 1 pound for $9.00? Explain your reasoning.

15 If you started the problem by converting 1 pound to 16 ounces, would you get the same result? Justify your conclusion.

16 Can you compare any two unit rates? Explain.

Try It

Use what you just learned about unit rates to solve this problem. Show your work on a separate sheet of paper.

17 Rina’s recipe uses 2 cups of sugar to make $2\frac{1}{2}$ dozen cookies. Jonah’s recipe uses $2\frac{1}{4}$ cups of sugar to make 3 dozen cookies. Which recipe uses more sugar for a dozen cookies? Why?
Study the model below. Then answer questions 18–20.

Oliver is training for a marathon. In practice, he runs 15 kilometers in 72 minutes. What is his speed in kilometers per hour?

**Convert the time in minutes to hours to find kilometers per hour.**

\[
\text{72 minutes} = \text{1 hour 12 minutes} = 1 \frac{1}{5} \text{ hours}
\]

\[
\frac{\text{km}}{\text{hr}} = \frac{15}{1 \frac{1}{5}} = \frac{15}{1 \frac{1}{5}} = \frac{15}{1 \frac{1}{5}} = 15 \div 1 \frac{1}{5} = 15 \div \frac{6}{5} = 15 \times \frac{5}{6}
\]

\[
\frac{75}{6} \text{ or } 12 \frac{1}{2}
\]

**Solution:** Oliver runs \(12 \frac{1}{2}\) kilometers per hour.

18 Alexis washes \(10 \frac{1}{2}\) windows in \(\frac{3}{4}\) hour. At this rate, how many windows can she wash in one hour?

**Solution:**
19. A restaurant uses $8 \frac{1}{4}$ pounds of carrots to make 6 carrot cakes. Frank wants to use the same recipe. How many pounds of carrots does Frank need to make one carrot cake?

*Show your work.*

**Solution:**

20. It takes Zach 15 minutes to walk $7 \frac{1}{2}$ blocks to the swimming pool. At this rate, how many blocks can he walk in one minute? Circle the letter of the correct answer.

A. $\frac{1}{5}$ block  
B. $\frac{1}{2}$ block  
C. 2 blocks  
D. 5 blocks

Dee chose C as the correct answer. What was her error?

________________________________________________________

________________________________________________________

________________________________________________________

**Pair/Share**

What steps did you take to find the unit rate?

What unit rate do you need to find?

Does Dee’s answer make sense?
Solve the problems. Mark your answers to problems 1–4 on the Answer Form to the right. Be sure to show your work.

1. A 14-ounce energy drink contains $10\frac{1}{2}$ teaspoons of sugar. How much sugar is in one ounce of the drink?
   
   A. $\frac{3}{4}$ teaspoon
   
   B. $1\frac{1}{3}$ teaspoons
   
   C. $1\frac{1}{2}$ teaspoons
   
   D. $3\frac{1}{2}$ teaspoons

2. Bennie swims 6 laps in $4\frac{1}{2}$ minutes. What is this rate in minutes per lap?
   
   A. $\frac{2}{3}$ minute per lap
   
   B. $\frac{3}{4}$ minute per lap
   
   C. $1\frac{1}{3}$ minutes per lap
   
   D. $1\frac{1}{2}$ minutes per lap

3. One of the highest snowfall rates ever recorded was in Silver Lake, Colorado, in April 1921, when just over 7 feet of snow fell in $27\frac{1}{2}$ hours. What was that rate in inches per hour?
   
   A. $\frac{14}{55}$ inch per hour
   
   B. $\frac{55}{158}$ inch per hour
   
   C. $3\frac{3}{55}$ inches per hour
   
   D. $3\frac{13}{14}$ inches per hour
4 A grocery store sells different types of Trail Mix. The cost and weight of each type is shown in the table.

<table>
<thead>
<tr>
<th></th>
<th>Trail Mix A</th>
<th>Trail Mix B</th>
<th>Trail Mix C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost ($ )</td>
<td>6</td>
<td>8.50</td>
<td>2.25</td>
</tr>
<tr>
<td>Weight</td>
<td>$\frac{3}{4}$ lb</td>
<td>1 lb</td>
<td>4 oz</td>
</tr>
</tbody>
</table>

1 lb = 16 oz

Which statement is correct?
A Trail Mix A is the best buy.
B Trail Mix B is the best buy.
C Trail Mix C is the best buy.
D They are all the same price.

5 Two friends worked out on treadmills at the gym.

- Alden walked 2 miles in $\frac{3}{4}$ hour.
- Kira walked $1 \frac{3}{4}$ miles in 30 minutes.

Who walked at a faster rate? Explain your reasoning.

**Show your work.**

**Answer**
Lesson 9  (Student Book pages 78–87)

Ratios Involving Complex Fractions

LESSON OBJECTIVES

• Compute unit rates involving ratios with a fraction in the denominator.
• Compute unit rates involving ratios with a fraction in the numerator.
• Compute unit rates involving ratios with fractions in both the numerator and denominator.

PREREQUISITE SKILLS

• Compute unit rates involving ratios with whole numbers.
• Find equivalent fractions.
• Divide fractions.
• Write whole numbers as fractions.

VOCABULARY

unit rate: the part of the rate that is being compared to 1

complex fraction: a fraction where either the numerator is a fraction, the denominator is a fraction, or both the numerator and the denominator are fractions

THE LEARNING PROGRESSION

Ratios (including rates, ratios, proportions, and percents) are commonplace in everyday life and critical for further study in math and science. In Grade 7, students extend the concepts of unit rate developed in Grade 6 to applications involving complex fractions. They transition from solving problems primarily with visual models to applying familiar algorithms. This lesson focuses on solving unit-rate problems that involve complex fractions. Students model real-world situations that involve ratios with fractions in the numerator and/or denominator. They learn to connect the process of simplifying complex fractions with the algorithm for the division of fractions. They learn how to interpret simplified ratios as unit rates to solve real-world problems.

CCLS Focus

7.RP.1  Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks \( \frac{1}{2} \) mile in each \( \frac{1}{4} \) hour, compute the unit rate as the complex fraction \( \frac{\frac{1}{2}}{\frac{1}{4}} \) miles per hour, equivalently 2 miles per hour.

STANDARDS FOR MATHEMATICAL PRACTICE: SMP 1, 6, 7 (see page A9 for full text)
AT A GLANCE

Students read a word problem and answer a series of questions designed to help them find a unit rate when one of the given quantities is a fraction.

STEP BY STEP

- Tell students that this page models how to use a diagram to find a rate in miles per hour when the time is given as a number of minutes less than an hour.
- Have students read the problem at the top of the page.
- Work through Explore It as a class.
- Have students look at the diagram and explain how to figure out how many rectangles it takes to represent 15 minutes.
- Help students understand that in the diagram, 4 rectangles represent the ratio 4 miles:15 minutes.
- Ask student pairs or groups to explain their answers for the remaining questions.

SMP Tip: Help students make sense of problems and persevere in solving them (SMP 1) by asking them to explain what they are asked to find and to identify the needed information. Allow plenty of wait time.

Visual Model

- Tell students that you will extend the diagram to show the number of miles per hour.
- Sketch the diagram on the board. Ask a volunteer to explain how many more rectangles you would need to draw to show 60 minutes instead of 45. [4] Add them to the diagram.
- Ask another volunteer to explain how to use the extended diagram to solve the problem.

Mathematical Discourse

- Why is it important that the first question says, “If Jana biked at a constant rate”?
  Listen for responses that indicate that a constant rate means the distance traveled is the same during each minute, so the problem can be solved with multiplication or division.
- The information is given in miles and minutes. Why might Jana want to know her rate in miles per hour instead of miles per minute?
  Listen for responses that note that she only rides a small part of a mile in one minute.
Students revisit the problem on page 78 to learn how to model it using a ratio written as a complex fraction. Then students simplify the complex fraction by dividing.

**STEP BY STEP**

- Read Find Out More as a class.
- Review the meaning of *unit rate*.
- Have students look at the ratio $\frac{12}{\frac{3}{4}}$. Ask, *Why is it not a unit rate?* [The number of hours must be one.]
- Have students describe how the ratio looks different from other fractions they have seen. Discuss the definition of a complex fraction. Ask students to give examples of complex fractions.
- Reinforce the idea that the fraction bar can mean division. Give other examples such as $\frac{15}{3}$ and $\frac{20}{5}$.
- Work through the steps used to divide $12 \div \frac{3}{4}$.
- Have students assess the reasonableness of the answer. Note that 1 hour is slightly more than 45 minutes and 16 miles is slightly more than 12 miles.

**ELL Support**

Write the word *per* on the board. Next to it, write *for each* and *in each*. Give examples such as “5 crayons *for each* student” means “5 crayons *per* student” and “driving 50 miles *in each* hour” means “50 miles *per* hour.” Give other examples and such as “$1.50 for each pound of peaches” or “3 cups of flour in each loaf of bread.” Have students restate each using the word *per*.

Then write *unit rate* on the board. Circle the word *unit* and write a 1 above it. Say that in 50 miles per hour, the unit rate is 50 because it tells the number of miles in 1 hour. The word *per* can mean *in one* or *for one*. Give more examples. Have students restate the ratio using the word *per* and then give the unit rate.

**Real-World Connection**

Encourage students to think of everyday situations in which measurements are given as fractions. Have volunteers share their ideas.

*Examples: Cooking \(\frac{3}{4}\) cup, \(\frac{1}{12}\) dozen; sewing \(\frac{5}{8}\) yard, \(2\frac{1}{2}\) feet; traveling \(12\frac{1}{2}\) miles in \(\frac{1}{4}\) hour, \(3\frac{1}{2}\) blocks in \(7\frac{1}{2}\) minutes*
Students use number lines to solve problems that require them to find unit rates by simplifying ratios involving complex fractions.

**STEP BY STEP**

- Read the problem at the top of the page as a class.
- Ask students to look at the recipe to find the number of eggs and cups of flour needed.
- Have students use their own words to explain what they are trying to find in order to solve this problem.
- Have students read Model It. Call students’ attention to the first double number line. Have them read the information and note the labels. Ask how the number line relates to the problem.
- Read the information above the second double number line. Discuss how to find the number that is halfway between 0 and \(1 \frac{1}{2}\). Guide students to see how they can use the unit rate to find the other numbers on the top number line.

**Hands-On Activity**

**Fold paper strips to model unit rate.**

**Materials:** strips of paper, scissors, markers, rulers

- Have students cut a strip of paper so that it is \(1 \frac{1}{2}\) inches long.
- Direct students to draw a line across the entire length of the paper then divide it into \(\frac{1}{4}\)-inch segments.
- Have students fold the paper in half and then determine the length of each half.
- On the board write \(1 \frac{1}{2} \div 2 = \frac{3}{4}\) and \(\frac{3}{4} \times 2 = 1 \frac{1}{2}\).
- Have students relate the result to the number line used to model the problem.

**Mathematical Discourse**

- **Why is it helpful to know a unit rate when shopping?**
  Student responses may include that unit rates allow shoppers to compare similar products of different sizes.
- **Does the problem ask you to find a unit rate? Explain why or why not.**
  Students should explain that it does ask for a unit rate because it asks for the amount of flour needed for 1 egg.
Students revisit the problem on page 80 to learn how to solve the problem by simplifying a ratio involving a complex fraction.

**STEP BY STEP**

- Read Connect It as a class. Be sure to point out that the questions refer to the problem on page 80.
- Emphasize the idea that since 1 egg is halfway between 0 and 2 eggs, the amount of flour must be halfway between 0 and 1 1/2 cups.
- Once students have written the ratio, have them explain why it is a complex fraction.
- Reinforce the idea that students can divide to simplify a complex fraction because the fraction bar indicates division.
- Have students simplify 1 1/2. Have them compare the steps they use to the steps used to find 1/2 of 1 1/2 on the number line.

**SMP Tip:** Students look for and make use of structure (SMP 7) when they explain how dividing 1 1/2 by 2 is the same as multiplying 1 1/2 by 1/2. Remind students that division by a number and multiplication by its reciprocal are equivalent operations.

### Concept Extension

**Help students see how the unit rate helps them find equivalent ratios.**

- Draw a ratio table on the board. Label the first row *Cups of flour* and the second row *Eggs*.
- Fill in the first two columns with information from Connect It.
- Have students fill in two more columns by multiplying the number of eggs by 3/4.
- Compare the results with the number line on page 80.
- Ask students to explain how to show that each ratio of flour to eggs is equal to 3/4.

### TRY IT SOLUTIONS

9. **Solution:** 3/8 cup; Students may draw a number line to show that 3/8 is halfway between 0 and 3/4. They may also write and simplify the ratio 3/4.

10. **Solution:** 2/3 teaspoon; Students may write and simplify the ratio 1 1/2. They may also draw a double number line with 1 teaspoon on the top line and 1 1/2 cups on the bottom line. They would show that 1 cup is 2/3 of 1 1/2 cups and then show 2/3 of 1 teaspoon.

**ERROR ALERT:** Students who wrote 1/2 found the amount of vanilla needed for 1 egg instead of for 1 cup of flour.
Students use double number lines to find a unit rate. Then students solve a problem by comparing unit rates.

**STEP BY STEP**

- Read the problem at the top of the page as a class.
- Ask, *Why can’t you just say that $7.50 is less than $9.00 so it is a better buy?* [The packages are different weights so they do not contain the same amount.]
- Read Model It as a class. Reinforce that when comparing unit rates, the units must be the same. Make sure students understand why 12 ounces is equivalent to \( \frac{3}{4} \) pound.
- Have students study the first double number line. Go over the steps used to draw the number line accurately.
- Direct students’ attention to the second number line. Ask, *How do we know that 2 \( \frac{1}{2} \) dollars lines up with \( \frac{1}{4} \) pounds?* \( \frac{1}{4} \) is one third of the way from 0 to \( \frac{3}{4} \), and \( 2 \frac{1}{2} \) is one third of the way from 0 to \( 7 \frac{1}{2} \).

**ELL Support**

- Write 1 pound on the board. Ask students to describe what we measure with pounds. Pounds are a unit of measure to find weight or how heavy an object is.
- Ask students how we would measure the weight of something less than a pound. Accept the idea that we could use a fraction of a pound. If no one mentions the term ounce, introduce it as a unit of measure less than 1 pound.
- Write 1 pound = 16 ounces on the board. Discuss the equivalency in concrete terms. *Dora has 16 ounces of grapes. That is the same as 1 pound of grapes.*

**Mathematical Discourse**

- **What are some equivalent ratios shown by the number line?**
  - Students may list \( \frac{2}{4}, \frac{5}{4}, \frac{7}{4}, \text{ and } \frac{10}{4} \).
- **Using the number line, how can you tell the ratios are equivalent? Can you explain it another way?**
  - Students may note that they are the same distances apart on the number line. They may also explain that when you double \( 2 \frac{1}{2} \) and \( \frac{1}{4} \) you get \( 5 \frac{1}{2} \) and \( \frac{1}{2} \), and when you triple them you get \( 7 \frac{1}{2} \) and \( \frac{3}{2} \). They may also explain that when you simplify each ratio, the result is 10 to 1.
Students revisit the problem on page 82. They learn to solve it by simplifying ratios to find unit rates. Then students compare the unit rates to solve the problem.

**STEP BY STEP**

- Read page 83 as a class. Be sure to point out that Connect It refers to the problem on page 82.
- Ask, *Once you know that each \( \frac{1}{4} \) pound costs $2.50, how can you figure out how much a full pound costs?* [There are 4 fourths in a whole, so you would multiply $2.50 by 4.]
- Have students explain why you would divide to simplify a ratio involving a complex fraction. Have students complete the division process individually and then review it as a class.
- Have volunteers present the reasoning they used to find the cost per ounce. Ask whether finding cost per ounce or the cost per pound is easier in this situation.

**SMP Tip:** Students should realize that it is important to specify cost as *per pound* or *per ounce* when writing and simplifying ratios. Be sure to model this language as you attend to precision (SMP 6) when working through this problem with students.

**TRY IT SOLUTION**

**17 Solution:** Rina’s recipe.; Students may simplify ratios to find the unit rate. Rina: \( \frac{2}{2} = \frac{2}{2} = \frac{1}{1} = \frac{4}{4} \).

Jonah: \( \frac{2\frac{1}{4}}{3} = \frac{2\frac{1}{4}}{3} = \frac{3}{4} \)

Each dozen of Rina’s cookies contains \( \frac{4}{3} \) cup sugar. Each dozen of Jonah’s contains \( \frac{3}{4} \) cup of sugar. Rina’s cookies use more sugar per dozen. \( \frac{4}{5} \) is greater than \( \frac{3}{4} \).

**ERROR ALERT:** Students who wrote Jonah may have found the rate of dozens of cookies per cup of sugar.

Rina: \( \frac{2\frac{1}{2}}{2} = 1 \frac{1}{4} \). Jonah: \( \frac{3}{2} = 1 \frac{1}{3} \) However, that means Jonah’s recipe has more cookies per cup of sugar, not more sugar per dozen cookies.
AT A GLANCE

Students write and simplify ratios to solve word problems involving unit rate. They may also use double number lines to find the solution.

STEP BY STEP

- Ask students to solve the problems individually and interpret their answers in the context of the problems.
- When students have completed each problem, have them Pair/Share to discuss their solutions with a partner or in a group.

SOLUTIONS

Ex The example shows how to write and simplify a ratio as one way to solve the problem. Students could also use a double number line.

18 Solution: 14; Students could solve the problem by simplifying $\frac{10\frac{1}{2}}{3}$ or use a double number line.

19 Solution: $1\frac{3}{4}$; Students could solve the problem by simplifying $\frac{8\frac{1}{4}}{6}$ or use a double number line.

20 Solution: B; Divide $7\frac{1}{2}$ by 15 to find the number of blocks per minute. Explain to students why the other two answer choices are not correct:

A is not correct because $7\frac{1}{2} \div 15 = 0.5$, which is $\frac{1}{2}$, not $\frac{1}{5}$.

D is not correct because it does not make sense for him to walk 5 blocks in one minute if it takes him 15 minutes to walk $7\frac{1}{2}$ blocks.
AT A GLANCE

Students find unit rates to solve word problems that might appear on a mathematics test.

STEP BY STEP

- First, tell students that they will find unit rates to solve word problems. Then have students read the directions and answer the questions independently. Remind students to fill in the correct answer choices on the Answer Form.

- After students have completed the Common Core Practice problems, review and discuss correct answers. Have students record the number of correct answers in the box provided.

SOLUTIONS

1. Solution: A; Write and simplify the ratio of ounces of sugar to ounces of energy drink, \(\frac{10\frac{1}{2}}{14}\).

2. Solution: B; Write and simplify the ratio of minutes to laps, \(\frac{4\frac{1}{2}}{6}\).

3. Solution: C; Rewrite 7 feet as 84 inches and then write and simplify the ratio of inches to hours, \(\frac{84}{27\frac{1}{2}}\).

4. Solution: A; Find the cost per pound for each brand. (Trail Mix A: $8/pound, B: $8.50/pound, C: $9/pound.) Then find the lowest unit rate.

5. Solution: Alden’s rate is \(\frac{2}{3}\) miles per hour.

Kira’s rate is \(\frac{3}{4}\) miles per hour. Kira’s rate is faster.
Assessment and Remediation

- A recipe calls for \( \frac{2\frac{1}{4}}{4} \) cups of sugar for \( 1\frac{1}{2} \) dozen cookies. Have students find the amount of sugar per dozen cookies. [1 \( \frac{1}{2} \) cups]
- For students who are struggling, use the chart below to guide remediation.
- After providing remediation, check students’ understanding. Have students find Carlos’ rate in laps per minute if he runs \( 6\frac{1}{4} \) laps in 10 minutes. \( \frac{5}{8} \)
- If a student is still having difficulty, use Ready Instruction, Level 7, Lesson 6.

<table>
<thead>
<tr>
<th>If the error is . . .</th>
<th>Students may . . .</th>
<th>To remediate . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{1}{8} )</td>
<td>have found the amount of sugar per cookie, not dozen.</td>
<td>Have students reread the problem and state what they need to find. Have them explain why they do not need to convert 1 ( \frac{1}{2} ) dozen to individual cookies.</td>
</tr>
<tr>
<td>( \frac{2}{3} )</td>
<td>have found the number of dozens per cup of sugar.</td>
<td>Write the ratio using words, ( \frac{\text{sugar}}{\text{dozen}} ). Have students substitute numbers for words.</td>
</tr>
<tr>
<td>( \frac{3\frac{3}{8}}{8} )</td>
<td>have multiplied instead of divided.</td>
<td>Remind students that the fraction bar indicates division. Review the steps used to divide two fractions.</td>
</tr>
<tr>
<td>any other answer</td>
<td>have divided incorrectly.</td>
<td>Go over the student’s work to make sure each step was done correctly.</td>
</tr>
</tbody>
</table>

Hands-On Activity

**Use a paper model to find unit rate.**

**Materials:** small pieces of paper that are the same shape and size

On the board, write “Sheila buys \( 9\frac{1}{3} \) pounds of nuts for 4 gift baskets. How many pounds of nuts does Sheila buy per gift basket?” Distribute 10 pieces of paper to each student. Tell students that each piece represents a pound of nuts. Ask, *How can you represent \( 9\frac{1}{3} \) pounds using the paper?* [Tear one sheet in thirds and discard two of the thirds.] Direct students to distribute the paper into 4 piles so that there is the same amount of paper in each pile. It is acceptable to tear the paper into pieces that are the same size. When students have completed the task, write \( \frac{9\frac{1}{3}}{4} = 2\frac{1}{3} \). Ask students what \( 2\frac{1}{3} \) represents.

Challenge Activity

**Extend the concept of unit rate to solve problems.**

Tell students that when Ginger made applesauce using \( 2\frac{1}{4} \) pounds of apples, she used \( 1\frac{1}{2} \) tablespoons of sugar. She now has 8 pounds of apples and wonders how much sugar she should use. Ask students how they could find and use the unit rate to solve the problem. [Possible answer: Find the unit rate by simplifying \( \frac{1\frac{1}{2}}{\frac{21}{4}} \), which is \( \frac{2}{3} \). Then either create a ratio table or multiply \( 8 \times \frac{2}{3} \) to show that Ginger should use \( 5\frac{1}{3} \) tablespoons of sugar for 8 pounds of apples.]