

1-1

Rational Numbers

Check Skills You'll Need

1. Vocabulary Review

Which fraction is a mixed number: $\frac{2}{3}$, $4\frac{1}{5}$, or $\frac{7}{6}$?

Write each improper fraction as a mixed number.

2. $\frac{9}{7}$

3. $\frac{11}{5}$

4. $\frac{25}{9}$

5. $\frac{30}{18}$



Skills Handbook
p. 394

CONTENT STANDARD

8.NS.1

What You'll Learn

To write equivalent fractions and decimals

New Vocabulary rational number, terminating decimal, repeating decimal

Why Learn This?

The baseball standings at the right use both decimals and fractions. Decimals and fractions are rational numbers.

A **rational number** is a number that can

be written in the form $\frac{a}{b}$, where a is an integer and b is any nonzero integer.

Every rational number has a decimal

expansion. You can write the decimal expansion of a fraction by dividing the numerator by the denominator. If the division results in a decimal that stops, the decimal is called a **terminating decimal**.

Team Standings

	W	L	PCT	GB
Houston	24	14	.632	—
St. Louis	19	19	.500	5
Milwaukee	17	20	.459	$6\frac{1}{2}$
Chicago	17	20	.459	$6\frac{1}{2}$
Pittsburgh	15	23	.395	9
Cincinnati	14	25	.359	$10\frac{1}{2}$



EXAMPLE Writing a Terminating Decimal

1 Baseball In baseball, a player's batting average is $\frac{\text{number of hits}}{\text{number of times at bat}}$. A batting average is rounded to three decimal places and is written without the leading 0.

Find the batting average of a hitter with 36 hits in 125 times at bat.

$$\frac{36}{125} \text{ or } 36 \div 125 = 125 \overline{)36.000} \quad 0.288 \leftarrow \text{This is a terminating decimal.}$$

$$\begin{array}{r} -250 \\ 1100 \\ -1000 \\ 1000 \\ -1000 \\ 0 \end{array}$$

0 ← There is no remainder.

$$\frac{36}{125} = 0.288. \text{ So the player's batting average is } .288.$$

Quick Check

- Find the batting average of a hitter with 22 hits in 80 times at bat.



Vocabulary Tip

The fraction $\frac{a}{b}$ means $a \div b$. You can write the fraction $\frac{a}{b}$ as $a \div b$.

If the decimal expansion repeats the same digit or group of digits forever, it is a **repeating decimal**. The repeating group can include one or more digits. You use a bar to indicate the repeating digits.

$$4.833333333333333 \dots = 4.8\overline{3} \leftarrow \text{The digit 3 repeats.}$$

$$0.181818181818 \dots = 0.\overline{18} \leftarrow \text{The digits 18 repeat.}$$

EXAMPLE Writing a Repeating Decimal

- 2 Write $\frac{27}{99}$ as a decimal.

$$\frac{27}{99} \text{ or } 27 \div 99 = 99 \overline{)27.00000} \quad \leftarrow \text{This is a repeating decimal.}$$

$$\underline{-198}$$

$$720$$

$$\underline{-693}$$

$$270$$

$$\underline{-198}$$

$$720$$

$$\underline{-693}$$

$$27$$

\leftarrow There will always be a remainder of 27 or 72.

$$\text{So } \frac{27}{99} = 0.\overline{27}.$$

Quick Check

2. Write $\frac{55}{60}$ as a decimal.

You can write a terminating decimal as a fraction by multiplying both the numerator and the denominator by the same power of 10.

EXAMPLE Writing an Equivalent Fraction

- 3 Write 1.345 as a mixed number in simplest form.

$$1.345 = \frac{1.345}{1} \quad \leftarrow \text{Write as a fraction with the denominator 1.}$$

$$= \frac{1,345}{1,000} \quad \leftarrow \text{Since there are 3 digits to the right of the decimal, multiply the numerator and the denominator by 1,000.}$$

$$= \frac{1,345 \div 5}{1,000 \div 5} \quad \leftarrow \text{Divide the numerator and the denominator by the GCF, 5.}$$

$$= \frac{269}{200} = 1\frac{69}{200} \quad \leftarrow \text{Simplify. Write as a mixed number.}$$

Quick Check

3. Write 1.42 as a mixed number in simplest form.



Check Your Understanding

- Vocabulary** Since 123 is a rational number, it can be written in the form $\frac{123}{\square}$.
- Number Sense** A player has 15 hits in 34 times at bat and then gets another hit. Did the batting average increase? Explain.

Match each fraction with its decimal expansion.

- | | |
|-------------------|----------------------|
| 3. $\frac{1}{4}$ | A. 0.5 |
| | B. $0.\overline{18}$ |
| 4. $\frac{1}{3}$ | C. $0.\overline{3}$ |
| | D. 0.25 |
| 5. $\frac{1}{2}$ | |
| 6. $\frac{2}{11}$ | |

Homework Exercises

For more exercises, see Extra Skills and Word Problems.

GO for Help

For Exercises	See Examples
7–23	1 and 2
24–31	3

Write the decimal expansion of each fraction.

- | | | | |
|----------------------|---------------------|---------------------|----------------------|
| 7. $\frac{15}{20}$ | 8. $\frac{48}{64}$ | 9. $-\frac{40}{60}$ | 10. $-\frac{12}{54}$ |
| 11. $\frac{20}{100}$ | 12. $\frac{18}{81}$ | 13. $-\frac{4}{11}$ | 14. $\frac{12}{60}$ |
| 15. $\frac{2}{3}$ | 16. $\frac{8}{25}$ | 17. $\frac{17}{16}$ | 18. $\frac{16}{18}$ |
| 19. $-\frac{13}{6}$ | 20. $\frac{9}{45}$ | 21. $\frac{5}{12}$ | 22. $-\frac{28}{35}$ |

23. **Sports** A baseball player has 34 hits in 102 times at bat. Another baseball player has 24 hits in 96 times at bat. Write each player's batting average.

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

- | | | | |
|---------|----------|-----------|----------|
| 24. 1.4 | 25. 0.33 | 26. 0.24 | 27. 4.44 |
| 28. 2.8 | 29. 0.05 | 30. 0.005 | 31. 7.32 |

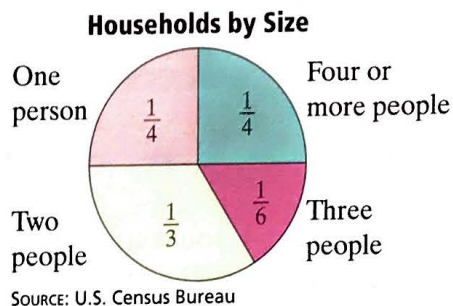
GPS

32. **Guided Problem Solving** At a chili festival over the past few years, Restaurant A won 56 out of 98 contests. Restaurant B won 84 out of 147 contests. Which restaurant has the better record?

- What decimal represents the wins for Restaurant A?
- What decimal represents the wins for Restaurant B?

33. **Population** In 2003, 0.219 of the people in the United States were younger than 15 years old. Write the decimal as a fraction.

34. The circle graph at the right shows the sizes of American households. Write a decimal for the fraction of households in each category.



35. **Algebra** Evaluate $\frac{1+a}{2b}$ for $a = 3$ and $b = -5$. Write your fraction as a decimal.
36. If Mr. Wagner forgot one of Mrs. Wagner's birthdays in 25 years, what would his "batting average" for remembering his wife's birthday?
37. **Writing in Math** Explain why, in 25 years of marriage, Mr. Wagner could never have a "batting average" for remembering birthdays of .980.
38. **Challenge** The number 77 is what fractional part of 7,777?



Test Prep and Mixed Review

Practice

Multiple Choice

39. Tyler reads for 3 hours each day. There are 24 hours in a day. What decimal represents the part of each day that Tyler spends reading?
 (A) 0.125 (B) 0.048 (C) $0.0\overline{37}$ (D) $0.01\overline{38}$
40. You earn a score of $\frac{38}{40}$ on your homework. What is the decimal expansion of the score you received?
 (F) 0.875 (G) 0.9 (H) 0.925 (J) 0.95
41. Brandon wrote the decimal 2.375 as a mixed number in simplest form as shown below.
- Step 1** $\frac{2.375}{1}$
- Step 2** $\frac{2,375}{10,000}$
- Step 3** $2,375 \div \frac{125}{10,000} \div 125$
- Step 4** $\frac{19}{80}$

In which step did Brandon make his first mistake?

- (A) Step 1 (B) Step 2 (C) Step 3 (D) Step 4

Find each sum or difference.

42. $42.7 + 7.385$ 43. $6 - 3.826$ 44. $7.2 + 1.89 + 19.8$

GO for Help

For Exercises 42–44	See Skills Handbook p. 383
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