NAME _____ DATE _____ PERIOD _____

# 5-1 Greatest Common Factor (pages 177–180)

Two or more numbers may both have the same factor, called a common factor. The greatest of the common factors of two or more numbers is called the **greatest common factor** (GCF) of the numbers. There are two methods you can use to find the GCF of two or more numbers.

| | |
|---|---|
| **Method 1: Listing Factors** | • List all of the factors of each number.<br>• Identify the common factors.<br>• The greatest of the common factors is the GCF. |
| **Method 2: Use Prime Factors** | • Write the prime factorization of each number<br>• Identify all of the common prime factors.<br>• The product of the common prime factors is the GCF. |

## EXAMPLES

**A** Find the GCF of 15 and 18.

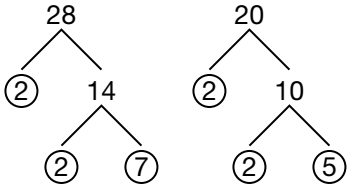
*Make a list of the factors of each number.*

*factors of 15: **1**, **3**, 5, 15*
*factors of 18: **1**, 2, **3**, 6, 9, 18*

*The common factors are 1 and 3.*
*The GCF of 15 and 18 is 3.*

**B** Find the GCF of 20 and 28.

*Write the prime factorization of each number.*




*The common prime factors are 2 and 2. The GCF of 20 and 28 is 2 × 2, or 4.*

### Try These Together

**1.** Find the GCF of 14 and 28.
*HINT: Make a list of factors.*

**2.** Find the GCF of 32 and 44.
*HINT: Use factor trees to find the common prime factors.*

## PRACTICE

***Find the GCF of each set of numbers.***

**3.** 7, 42
**4.** 10, 36
**5.** 44, 66
**6.** 30, 35
**7.** 4, 12, 28
**8.** 26, 52, 91
**9.** 62, 93
**10.** 59, 118
**11.** 25, 75
**12.** 30, 33
**13.** 14, 18, 22
**14.** 38, 57, 114

**15. Sales** Anton has made 24 gingersnaps, 60 peanut butter cookies, and 84 sugar cookies for a bake sale. What is the greatest number of boxes that he can pack them in so that the boxes contain the same number and types of cookies?

**16.** **Standardized Test Practice** What is the GCF of 40 and 72?

**A** 2 **B** 4 **C** 8 **D** 16

**Answers:** 1. 14 2. 4 3. 7 4. 2 5. 22 6. 5 7. 4 8. 13 9. 31 10. 59 11. 25 12. 3 13. 2 14. 19 15. 12 boxes 16. C

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NAME _____ DATE _____ PERIOD _____

# 5-2 Simplifying Fractions (pages 182–185)

You can write the fraction $\frac{2}{4}$ as $\frac{1}{2}$ and also as $\frac{4}{8}$. These fractions are **equivalent fractions**, because they name the same number. Use equivalent fractions to write fractions in **simplest form**. A fraction is in simplest form when the GCF of the numerator and denominator is 1.

| | |
|---|---|
| **Finding Equivalent Fractions** |  Two out of four, or $\frac{2}{4}$ of the parts of the rectangle are shaded.<br>  One out of two, or $\frac{1}{2}$ of the parts of the rectangle is shaded.<br>The rectangles are the same size, and the same amount of each is shaded, so the fractions are equivalent. |
| | $\frac{2}{4} \overset{\div 2}{=} \frac{1}{2}$ $\quad \frac{1}{2} \overset{\times 2}{=} \frac{2}{4}$<br>Multiply or divide both the numerator and the denominator of a fraction by the same nonzero number. |

## EXAMPLES

***Replace each ■ with a number so that the fractions are equivalent.***

**A** $\frac{2}{3} = \frac{6}{■}$

*Since $2 \times 3 = 6$, multiply the denominator also by 3.*

$\frac{2}{3} = \frac{6}{9}$

**B** $\frac{15}{20} = \frac{■}{4}$

*Since $20 \div 5 = 4$, divide the numerator also by 5.*

$\frac{15}{20} = \frac{3}{4}$

### Try These Together

**1.** $\frac{5}{6} = \frac{20}{■}$

*HINT: Multiply the numerator and denominator by the same number.*

**2.** Write $\frac{10}{12}$ in simplest form.

*HINT: The GCF of the numerator and denominator must be 1.*

## PRACTICE

***Replace each ■ with a number so that the fractions are equivalent.***

**3.** $\frac{2}{3} = \frac{18}{■}$

**4.** $\frac{8}{24} = \frac{■}{3}$

**5.** $\frac{5}{6} = \frac{30}{■}$

**6.** **Standardized Test Practice** What is $\frac{27}{30}$ in simplest form?

**A** $\frac{2}{3}$ **B** $\frac{9}{15}$ **C** $\frac{22}{24}$ **D** $\frac{9}{10}$

Answers: 1. 24 2. $\frac{5}{6}$ 3. 27 4. 1 5. 36 6. D

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NAME _____ DATE _____ PERIOD _____

# 5-3 Mixed Numbers and Improper Fractions (pages 186–189)

A **mixed number** shows the sum of a whole number and a fraction. For example, $2\frac{5}{6}$ is a mixed number that means $2 + \frac{5}{6}$. A fraction such as $\frac{8}{7}$, where the numerator is greater than or equal to the denominator, is known as an **improper fraction**. You can rewrite a mixed number as an improper fraction.

| | |
|---|---|
| **Writing Mixed Numbers as Improper Fractions** | To write a mixed number as an improper fraction, first multiply the whole number by the denominator and add the numerator. Write this sum over the denominator. $2\frac{1}{8} = \frac{(2 \times 8) + 1}{8} = \frac{17}{8}$ |
| **Writing Improper Fractions as Mixed Numbers** | Express $\frac{5}{3}$ as a mixed number. Divide the numerator by the denominator.<br>$3\overline{)5}$ R 1<br>$-3$<br>2<br>Write the remainder in the numerator of a fraction that has the divisor as the denominator. So $\frac{5}{3} = 1\frac{2}{3}$. |

## EXAMPLES

**A** Write $3\frac{2}{3}$ as an improper fraction.

$3\frac{2}{3} = \frac{(3 \times 3) + 2}{3} = \frac{11}{3}$ *Multiply 3 by 3 and add 2. Write the result over 3.*

**B** Write $\frac{8}{7}$ as a mixed number.

*8 ÷ 7 = 1 R1 Write the remainder in the numerator of a fraction that has the divisor as the denominator.*

$\frac{8}{7} = 1\frac{1}{7}$

## PRACTICE

***Write each mixed number as an improper fraction.***

**1.** $4\frac{1}{7}$ **2.** $10\frac{2}{5}$ **3.** $3\frac{1}{2}$ **4.** $5\frac{5}{9}$

***Write each improper fraction as a mixed number.***

**5.** $\frac{11}{2}$ **6.** $\frac{16}{5}$ **7.** $\frac{23}{8}$ **8.** $\frac{25}{3}$

**9.** **Standardized Test Practice** Write two and two-ninths as an improper fraction.

**A** $\frac{22}{9}$ **B** $\frac{20}{9}$ **C** $\frac{18}{9}$ **D** $\frac{12}{9}$

**Answers:** 1. $\frac{29}{7}$ 2. $\frac{52}{5}$ 3. $\frac{7}{2}$ 4. $\frac{50}{9}$ 5. $5\frac{1}{2}$ 6. $3\frac{1}{5}$ 7. $2\frac{7}{8}$ 8. $8\frac{1}{3}$ 9. B

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NAME _____ DATE _____ PERIOD _____

# 5-4 Least Common Multiple (pages 194–197)

A **multiple** of a number is the product of that number and any whole number. Two different numbers can share some of the same multiples. These are called **common multiples**. The least of the common multiples of two or more numbers, other than zero, is called the **least common multiple (LCM)**. Use the following methods to find the LCM.

| | |
|---|---|
| **Method 1: Make a List** | • List the nonzero multiples of each number.<br>• Identify the LCM from the common multiples. |
| **Method 2: Use Prime Factors** | • Write the prime factorization for each number.<br>• Identify all common prime factors. Then find the product of the common prime factors using each common factor only once, and multiply by any remaining prime factors. This product is the LCM. |

## EXAMPLES

**A** Find the LCM of 4 and 6 by making a list.

*multiples of 4: 4, 8, **12**, 16, 20, **24***
*multiples of 6: 6, **12**, 18, **24**, 30*
*The LCM of 4 and 6 is 12.*

**B** Find the LCM of 10 and 12.

*Use prime factorization.*
$10 = 2 \times 5$
$12 = 2 \times 2 \times 3$
*The LCM is $2 \times 2 \times 3 \times 5$, or 60.*

### Try These Together

**1.** Find the LCM of 6 and 8.
*HINT: List the nonzero multiples of each number.*

**2.** Find the LCM of 8 and 10.
*HINT: Use prime factorization. Use common prime factors only once.*

## PRACTICE

***Find the LCM of each set of numbers.***

| | | | |
|---|---|---|---|
| **3.** 2 and 7 | **4.** 8 and 12 | **5.** 25 and 30 | **6.** 6 and 21 |
| **7.** 3 and 8 | **8.** 8 and 18 | **9.** 4 and 10 | **10.** 15 and 35 |
| **11.** 7 and 14 | **12.** 3 and 5 | **13.** 4 and 9 | **14.** 4 and 22 |
| **15.** 20 and 45 | **16.** 2, 9, and 15 | **17.** 3, 15, and 45 | **18.** 10, 30, and 65 |

**19. Design** Ingrid is stringing 3 bracelets, one with 4 mm beads, one with 5 mm beads, and one with 6 mm beads. What is the shortest length where all the bracelets are equal?

**20.** **Standardized Test Practice** Find the LCM of 5, 6, and 45.

**A** 45 **B** 60 **C** 90 **D** 135

**Answers:** **1.** 24 **2.** 40 **3.** 14 **4.** 24 **5.** 150 **6.** 42 **7.** 24 **8.** 72 **9.** 20 **10.** 105 **11.** 14 **12.** 15 **13.** 36 **14.** 44 **15.** 180 **16.** 90 **17.** 45 **18.** 390 **19.** 60 mm **20.** C

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NAME _____ DATE _____ PERIOD _____

# 5-5 Comparing and Ordering Fractions

(pages 198–201)

To compare fractions with different denominators, find the **least common denominator (LCD)**, or the LCM of the denominators.

## EXAMPLES

**A** Find the LCD for $\frac{1}{2}$ and $\frac{1}{3}$.

*The LCD of $\frac{1}{2}$ and $\frac{1}{3}$ is the LCM of 2 and 3.*
*Multiples of 2: 0, 2, 4, **6**, 8*
*Multiples of 3: 0, 3, **6**, 9*
*The LCM of 2 and 3 is 6, so the LCD for $\frac{1}{2}$ and $\frac{1}{3}$ is also 6.*

**B** Which fraction is greater, $\frac{2}{3}$ or $\frac{3}{4}$?

*Find the LCD of $\frac{2}{3}$ and $\frac{3}{4}$. The LCM of 3 and 4 is 12, so the LCD is also 12.*
*$\frac{2}{3} = \frac{8}{12}$ and $\frac{3}{4} = \frac{9}{12}$. Multiply the numerator and denominator of $\frac{2}{3}$ by 4 and multiply the numerator and denominator of $\frac{3}{4}$ by 3 in order to rewrite $\frac{2}{3}$ and $\frac{3}{4}$ as equivalent fractions with 12 as the denominator. Since $\frac{8}{12} < \frac{9}{12}$, it is true that $\frac{2}{3} < \frac{3}{4}$, so $\frac{3}{4}$ is the greater fraction.*

### Try These Together

**1.** Find the LCD for $\frac{2}{5}$ and $\frac{1}{6}$.

*HINT: Find the LCM of the denominators.*

**2.** Which fraction is greater, $\frac{1}{4}$ or $\frac{2}{5}$?

*HINT: Find the LCD and then multiply both numerator and denominator to rewrite the fractions with the same denominator.*

## PRACTICE

***Find the LCD for each pair of fractions.***

**3.** $\frac{2}{5}, \frac{1}{3}$ **4.** $\frac{4}{7}, \frac{9}{14}$ **5.** $\frac{3}{10}, \frac{7}{8}$ **6.** $\frac{1}{4}, \frac{3}{8}$

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

**7.** $\frac{4}{7}$ ● $\frac{8}{14}$ **8.** $\frac{2}{7}$ ● $\frac{1}{9}$ **9.** $\frac{1}{6}$ ● $\frac{3}{18}$ **10.** $\frac{2}{5}$ ● $\frac{1}{3}$

**11.** $\frac{1}{5}$ ● $\frac{2}{10}$ **12.** $\frac{4}{34}$ ● $\frac{3}{17}$ **13.** $\frac{11}{12}$ ● $\frac{13}{16}$ **14.** $\frac{13}{22}$ ● $\frac{7}{11}$

**15. Population** The U.S. Census Bureau estimates that 10- to 19-year-olds are about $\frac{3}{20}$ of the population, and 35- to 44-year-olds are about $\frac{4}{25}$. Which age group represents more of the population?

**16.** **Standardized Test Practice** Order the fractions $\frac{1}{7}, \frac{2}{6}$, and $\frac{3}{8}$ from least to greatest.

**A** $\frac{3}{8}, \frac{2}{6}, \frac{1}{7}$ **B** $\frac{1}{7}, \frac{3}{8}, \frac{2}{6}$ **C** $\frac{2}{6}, \frac{1}{7}, \frac{3}{8}$ **D** $\frac{1}{7}, \frac{2}{6}, \frac{3}{8}$

**Answers:** 1. 30 2. $\frac{2}{5}$ 3. 15 4. 14 5. 40 6. 8 7. = 8. > 9. = 10. > 11. = 12. < 13. > 14. < 15. 35–44 16. D

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NAME _____ DATE _____ PERIOD _____

# 5-6 Writing Decimals as Fractions

(pages 202–205)

Decimals like 0.58, 0.32, 0.16, and 0.08 can be written as fractions with denominators of 10, 100, 1,000, and so on.

## EXAMPLES

**A** Write 0.5 as a fraction in simplest form.

*0.5* — *The decimal 0.5 is read as "five tenths."*

$0.5 = \frac{5}{10}$ — *Write the decimal as the fraction "five tenths."*

$= \frac{1}{2}$ — *Simplify. Divide the numerator and the denominator each by the GCF, 5.*

**B** Write 2.25 as a mixed number in simplest form.

*2.25* — *The decimal is read as "two and twenty-five hundredths."*

$2.25 = 2\frac{25}{100}$ — *Write the decimal as the mixed number "two and twenty-five hundredths."*

$= 2\frac{1}{4}$ — *Simplify. Divide the numerator and the denominator each by the GCF, 25.*

### Try These Together

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

**1.** 0.62

*HINT: Say the decimal aloud, and then write it as a fraction. Simplify the fraction.*

**2.** 12.84

*HINT: Say the decimal aloud and then write it as a mixed number. Simplify the mixed number.*

## PRACTICE

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

| | | | |
|---|---|---|---|
| **3.** 3.3 | **4.** 2.15 | **5.** 4.007 | **6.** 1.78 |
| **7.** 7.66 | **8.** 4.1 | **9.** 7.91 | **10.** 8.02 |
| **11.** 3.8 | **12.** 0.08 | **13.** 9.76 | **14.** 4.03 |
| **15.** 5.25 | **16.** 0.034 | **17.** 9.28 | **18.** 3.48 |

**19. Fashion** A bottle of hairspray holds 8.45 fluid ounces. Express this as a mixed number in simplest form.

**20.** **Standardized Test Practice** Write two and forty-four hundredths as a mixed number in simplest form.

**A** $2\frac{11}{25}$ **B** $2\frac{44}{100}$ **C** $2\frac{11}{250}$ **D** $2\frac{22}{50}$

**Answers:** **1.** $\frac{31}{50}$ **2.** $12\frac{21}{25}$ **3.** $3\frac{3}{10}$ **4.** $2\frac{3}{20}$ **5.** $4\frac{7}{1,000}$ **6.** $\frac{139}{50}$ **7.** $\frac{733}{50}$ **8.** $4\frac{1}{10}$ **9.** $\frac{791}{100}$ **10.** $8\frac{1}{50}$ **11.** $3\frac{4}{5}$ **12.** $\frac{2}{25}$ **13.** $9\frac{19}{25}$ **14.** $4\frac{3}{100}$ **15.** $5\frac{1}{4}$ **16.** $\frac{17}{500}$ **17.** $9\frac{7}{25}$ **18.** $3\frac{12}{25}$ **19.** $8\frac{9}{20}$ **20.** A

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NAME _____ DATE _____ PERIOD _____

# 5-7 Writing Fractions as Decimals

(pages 206–209)

Any fraction can be written as a decimal by using division.

| | |
|---|---|
| **Terminating Decimals** | Decimals like 0.45 and 0.85 are **terminating decimals** because the division ends, or terminates, when the remainder is zero. $\frac{4}{5}$ means $4 \div 5$. Divide 4 by 5, and the quotient 0.8 is the decimal you want to find. |
| **Repeating Decimals** | Decimals like 0.333333 . . . are called **repeating decimals** because the digits repeat. **Bar notation** can be used to indicate that decimals repeat. $0.6666666 \ldots = 0.\overline{6}$, $0.277777 \ldots = 0.2\overline{7}$, $0.737373 \ldots = 0.\overline{73}$ Bar notation is useful because some fractions, when written as decimals, are repeating decimals. For example, $\frac{2}{3} = 0.\overline{6}$. |

## EXAMPLES

***Write each fraction as a decimal.***

**A** $\frac{1}{5}$

$\frac{1}{5} = 1 \div 5$

$5\overline{)1.0}$ — *Divide 1 by 5.*

$-10$

$0$ — *Therefore, $\frac{1}{5} = 0.2$.*

**B** $\frac{1}{3}$

$\frac{1}{3} = 1 \div 3$

$3\overline{)1.00}$ — *Divide 1 by 3.*

$-9$

$10$ — *This pattern will continue forever.*

$-9$

$10$

*$\frac{1}{3}$ is a repeating decimal, $0.\overline{3}$.*

### Try These Together

***Write each fraction or mixed number as a decimal.***

**1.** $\frac{3}{4}$ *HINT: Divide 3 by 4.*

**2.** $2\frac{1}{2}$ *HINT: The whole number is written to the left of the decimal point.*

## PRACTICE

***Write each fraction or mixed number as a decimal.***

**3.** $4\frac{1}{8}$

**4.** $\frac{1}{6}$

**5.** $\frac{5}{9}$

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

**7.** $5\frac{11}{12}$

**8.** $\frac{8}{11}$

**9.** $\frac{8}{9}$

**10.** $6\frac{3}{10}$

**11.** **Standardized Test Practice** Write $2\frac{5}{12}$ as a decimal.

**A** 2.4166 **B** $2.41\overline{6}$ **C** $2.\overline{146}$ **D** 2.41666

**Answers:** 1. 0.75 2. 2.5 3. 4.125 4. $0.1\overline{6}$ 5. $0.\overline{5}$ 6. 0.4 7. $5.9\overline{16}$ 8. $0.\overline{72}$ 9. $0.\overline{8}$ 10. 6.3 11. B

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NAME _____ DATE _____ PERIOD _____

# 5 Chapter 5 Review

## Funny Money

Until recently, the prices of stocks sold on the New York Stock Exchange were listed as mixed numbers. For example, the price of a stock would be $\$58\frac{1}{4}$ instead of \$58.25.

When you go to the corner store, you see prices displayed in dollars and cents, or in decimal form. Suppose you go to the corner store one day, and you see all of the prices displayed as fractions and mixed numbers. Will you know how much to pay?

**1.** You go to the cooler for a soda. The price of the bottle is listed as $\frac{4}{5}$ of a dollar. What is this price in dollars and cents?

**2.** You see a sign saying granola bars are on sale. The price is $\$1\frac{2}{8}$. If a candy bar costs $\$1\frac{1}{5}$, which bar is less expensive? How much is each bar in dollars and cents?

**3.** Draw lines to match the prices of the items in the left column with the prices in the right column. All prices have been rounded to the nearest cent.

| | | |
|---|---|---|
| banana (1) | $\$\frac{1}{8}$ | \$1.40 |
| paper towel (roll) | $\$1\frac{2}{5}$ | \$0.30 |
| one dozen eggs | $\$\frac{19}{20}$ | \$0.13 |
| hard candies (each) | $\$\frac{3}{10}$ | \$0.95 |

**4.** One of your favorite snacks, bagels, used to sell for \$1.33 each. What would they sell for now that the store uses fractional prices?

Answers are located on p. 105.

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