**5-2****Greatest Common Factor** (pages 203–206)

The **greatest common factor (GCF)** of two or more numbers is the greatest number that is a factor of each number.

<b>Finding the Greatest Common Factor</b>	<p>To find the GCF of two or more numbers:</p> <ul style="list-style-type: none"> <li>• Method 1: List the factors of each number and then identify the common factors. The greatest of these common factors is the GCF.</li> <li>• Method 2: Write the prime factorization of each number, or divide by prime numbers until the quotient is prime. Then identify all common prime factors and find their product, which is the GCF.</li> </ul>
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**EXAMPLES**

- A** Find the GCF of 12, 20, and 36 by listing factors.

factors of 12: 1, 2, 3, 4, 6, 12

factors of 20: 1, 2, 4, 5, 10, 20

factors of 36: 1, 2, 3, 4, 6, 9, 12, 18, 36

The greatest of the common factors is 4, which is the GCF of 12, 20, and 36.

- B** Find the GCF of 27 and 90 by using prime factorization.

prime factorization of 27:  $3 \times 3 \times 3$

prime factorization of 90:  $2 \times 3 \times 3 \times 5$

The common prime factors are 3 and 3. Their product is 9. The GCF of 27 and 90 is 9.

**Try These Together**

1. Find the GCF of 12 and 16 by listing factors.

*HINT: Circle the factors common to 12 and 16. Then choose the greatest of those circled.*

2. Find the GCF of  $15 = 3 \times 5$  and  $50 = 2 \times 5^2$  by listing common prime factors.

*HINT: There is only one common prime factor.*

**PRACTICE**

Find the GCF of each set of numbers by listing factors.

3. 54, 81

4. 72, 90

5. 132, 144

6. 20, 36, 44

Find the GCF of each set of numbers by listing common prime factors.

7.  $9 = 3^2$   
 $36 = 2^2 \times 3^2$

8.  $45 = 3^2 \times 5$   
 $81 = 3^4$

Find the GCF of each set of numbers by writing prime factorizations.

9. 12, 48

10. 36, 54

11. 60, 42

12. **Life Science** The smallest adult male gorillas weigh about 135 kilograms. The smallest adult female gorillas weigh about 70 kilograms. What is the greatest common factor of these two numbers?

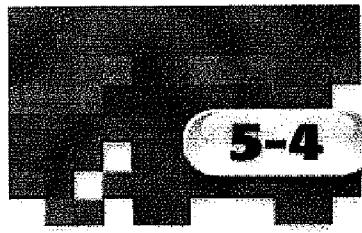
13. **Standardized Test Practice** Find the greatest common factor of 96 and 360.

A 5

B 12

C 36

D 24

**5-4****Decimals and Fractions** (pages 210–213)

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

<b>Write a Fraction as a Decimal</b>	Use paper and pencil to write $\frac{4}{5}$ as a decimal. $\frac{4}{5}$ means $4 \div 5$ . Divide 4 by 5, and the quotient is the decimal you want to find, 0.8.
<b>Repeating Decimals</b>	Decimals like 0.333333... are called <b>repeating decimals</b> because the digits repeat. <b>Bar notation</b> can be used to indicate that decimals repeat. $0.666666... = 0.\overline{6}$ , $0.277777... = 0.2\overline{7}$ , $0.737373... = 0.\overline{73}$ Bar notation is useful because some fractions, when written as decimals, are repeating decimals. For example, $\frac{2}{3} = 0.\overline{6}$ .

**EXAMPLES**

Express the fractions as decimals. Use bar notation for repeating decimals.

A  $\frac{3}{5}$

$$\frac{3}{5} = 3 \div 5$$

$$\begin{array}{r} 0.6 \\ 5 \overline{)3.0} \\ \underline{-3.0} \\ 0 \end{array} \quad \begin{array}{l} \text{Divide 3 by 5.} \\ \text{Therefore, } \frac{3}{5} = 0.6. \end{array}$$

B  $\frac{3}{11}$

$$\frac{3}{11} = 3 \div 11$$

$$\begin{array}{r} 0.2727 \dots \\ 11 \overline{)3.00} \\ \underline{-22} \\ 80 \\ \underline{-77} \\ 30 \\ \underline{-22} \\ 8 \end{array}$$

Divide 3 by 11. The digits 2 and 7 will repeat since 8 and 3 will continue to alternate as the remainders.

Therefore,  $\frac{3}{11} = 0.\overline{27}$ .

**Try These Together**

Express each fraction or mixed number as a decimal. If the decimal is a repeating decimal, use bar notation.

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

HINT: Divide 1 by 6.

2.  $4\frac{7}{8}$

HINT: The whole number is written to the left of the decimal point.

**PRACTICE**

Express each fraction or mixed number as a decimal. If the decimal is a repeating decimal, use bar notation.

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

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

5.  $\frac{12}{25}$

6.  $5\frac{2}{3}$

7.  $8\frac{4}{9}$

8.  $7\frac{1}{4}$

9. **Standardized Test Practice** Suppose that  $\frac{1}{8}$  of D'andre's class scored As on their science exam. Express this fraction as a decimal.

A 0.215

B 0.125

C 0.252

D 0.115

**5-5****Fractions and Percents** (pages 216–219)

A **percent** is a ratio that compares a number to 100. Fractions and percents are ratios that represent the same number.

<b>Expressing a Ratio as a Percent</b>	$\frac{n}{100} = n\%$ To express a ratio as a percent, first write the ratio as a fraction with a denominator of 100. Then rewrite $\frac{n}{100}$ as $n\%$ .
<b>Expressing a Fraction as a Percent</b>	To express a fraction as a percent, multiply both numerator and denominator by the same factor to rewrite the fraction as an equivalent fraction with a denominator of 100.

**EXAMPLES**

- A** Express as a percent: 37 students out of 100.

Write the ratio as a fraction:  $\frac{37}{100}$ .

$\frac{37}{100}$  is 37%.

- B** Express  $\frac{7}{25}$  as a percent.

To rewrite  $\frac{7}{25}$  as an equivalent fraction with a denominator of 100, multiply both numerator and denominator by 4, since  $100 \div 25$  is 4.

$$\frac{7 \times 4}{25 \times 4} = \frac{28}{100}, \frac{28}{100} \text{ is } 28\%.$$

$$\frac{7}{25} = 28\%$$

**Try These Together**

1. Express as a percent: 32.5 square miles in 100.

*HINT: Write as a fraction with a denominator of 100.*

2. Express  $\frac{3}{5}$  as a percent.

*HINT: Recall that  $\frac{n}{100} = n\%$ .*

**PRACTICE**

**Express each ratio or fraction as a percent.**

3. 62 out of 100

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

5.  $\frac{12}{100}$

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

7. \$55 per \$100

8.  $\frac{13}{20}$

9. **Computers** 78 out of 100 computers at Tina's school have CD-ROM drives. Express 78 out of 100 as a percent.

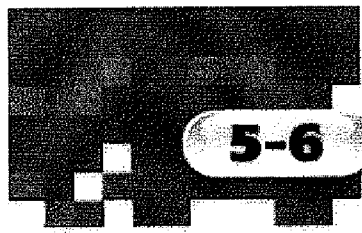
10. **Standardized Test Practice** In Enrique's school, 61 out of every 100 students eat a hot lunch. Express this ratio as a percent.

**A** 3.9%

**B** 6.1%

**C** 61%

**D** 39%

**5-6****Percents and Decimals** (pages 220–223)

Any decimal can also be written as a fraction. You can use this to express any decimal as a percent.

<b>Writing a Decimal as a Percent</b>	To write 0.32 as a percent, multiply the decimal by 100 and add the percent symbol. So, $0.32 = 0.\underline{32} = 32\%$ .
<b>Writing a Percent as a Decimal</b>	To write a percent as a decimal, divide the percent by 100 and remove the percent symbol. $64\% = \underline{64} = 0.64$ .

**EXAMPLES**

**A** Write 0.72 as a percent.

$0.72 = 72\%$  *Multiply the decimal by 100 and add the percent symbol.*

**B** Write 57% as a decimal.

$57\% = 0.57$  *Divide the percent by 100 and remove the percent symbol.*

**Try These Together**

**Express each decimal as a percent.**

1. 0.25

2. 0.76

*HINT: Multiply by 100 and add the percent symbol.*

**PRACTICE**

**Express each decimal as a percent.**

3. 0.54

4. 0.67

5. 0.1

6. 0.08

7. 0.42

8. 0.17

**Express each percent as a decimal.**

9. 48%

10. 75%

11. 9%

12. 23%

13. 35%

14. 99.8%

15. 4%

16. 15.1%

17. What decimal is equivalent to 39.5%?

18. Write the percent that is equivalent to 0.652.

19. **Recycling** In a recent year, the aluminum recycling rate was 62.8%. Write this percent as a decimal.



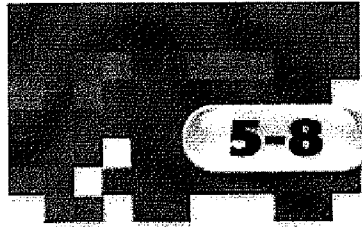
20. **Standardized Test Practice** In the mid-1990s, 48% of the working people in the world were employed in agriculture. How is this percent written as a decimal?

**A** 0.048

**B** 48

**C** 4.8

**D** 0.48



**5-8**

**Comparing and Ordering Rational Numbers**

(pages 227–231)

To compare fractions, rewrite each fraction using the same denominator. Then you only need to compare the numerators.

<p><b>Finding the Least Common Denominator</b></p>	<p>A <b>common denominator</b> is a common multiple of the denominators of two or more fractions. The <b>least common denominator (LCD)</b> is the least common multiple (LCM) of the denominators of two or more fractions.</p> <p>To compare two fractions:</p> <ul style="list-style-type: none"> <li>• find the LCM of the denominators, then</li> <li>• rewrite each fraction using this LCM as the LCD. Compare the numerators.</li> </ul>
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**EXAMPLES**

**A** Find the LCD for  $\frac{5}{6}$  and  $\frac{9}{10}$ .  
*The LCM of 6 and 10 is 30, so the LCD for  $\frac{5}{6}$  and  $\frac{9}{10}$  is 30.*

**B** Is  $\frac{5}{6} <, >, \text{ or } = \frac{9}{10}$ ?  
*Rewrite each fraction with the LCD of 30.*  
*Multiply the numerator and denominator of  $\frac{5}{6}$  by 5.*  
*Multiply the numerator and denominator of  $\frac{9}{10}$  by 3.*

$$\frac{5}{6} = \frac{25}{30} \quad \frac{9}{10} = \frac{27}{30}$$

*Since  $\frac{25}{30} < \frac{27}{30}$ ,  $\frac{5}{6} < \frac{9}{10}$ .*

**Try These Together**

1. Find the LCD for  $\frac{3}{4}$  and  $\frac{2}{3}$ .  
*HINT: Find the LCM of 4 and 3.*

2. Is  $\frac{5}{8} <, >, \text{ or } = 0.4$ ?  
*HINT: Write both rational numbers as fractions with the same denominator or as decimals.*

**PRACTICE**

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

3.  $\frac{5}{12}, \frac{3}{8}$

4.  $\frac{2}{5}, \frac{4}{7}$

5.  $\frac{4}{15}, \frac{1}{3}$

6.  $\frac{1}{6}, \frac{1}{9}$

7.  $\frac{1}{6}, \frac{5}{7}$

8.  $\frac{19}{30}, \frac{7}{10}$

9.  $\frac{9}{16}, \frac{1}{4}$

10.  $\frac{5}{36}, \frac{11}{24}$

**Replace each  $\bullet$  with  $<, >, \text{ or } =$  to make a true sentence.**

11.  $\frac{8}{9} \bullet \frac{5}{6}$

12.  $\frac{2}{3} \bullet \frac{8}{13}$

13.  $\frac{5}{6} \bullet 0.75$

14.  $\frac{3}{5} \bullet \frac{5}{8}$

15.  $\frac{2}{7} \bullet 0.25$

16.  $0.7 \bullet \frac{14}{20}$

17.  $\frac{5}{11} \bullet \frac{13}{22}$

18.  $\frac{15}{48} \bullet \frac{3}{8}$



19. **Standardized Test Practice** What is the least common denominator for  $\frac{1}{8}$  and  $\frac{5}{6}$ ?

**A** 36

**B** 24

**C** 18

**D** 45

**6-2****Adding and Subtracting Fractions** (pages 244–247)

To add or subtract fractions, the denominators must be the same.

**Adding and Subtracting Fractions with Unlike Denominators**

To add or subtract fractions:

- Rename the fractions with a common denominator as necessary.
- Add or subtract the numerators and use the common denominator in the sum or difference.
- Simplify if necessary.

**EXAMPLES**

**A** Add  $\frac{3}{4} + \frac{5}{6}$ .

Remember that the least common denominator of 4 and 6 is their least common multiple (12).

Multiply to rename with the LCD:

$$\frac{3 \times 3}{4 \times 3} + \frac{5 \times 2}{6 \times 2}$$

Add  $\frac{9}{12} + \frac{10}{12} = \frac{19}{12}$  and simplify:  $1\frac{7}{12}$ .

**B** Subtract  $\frac{2}{3} - \frac{1}{6}$ .

The LCD is 6.

$$\frac{2}{3} - \frac{1}{6} = \frac{2 \times 2}{3 \times 2} - \frac{1}{6} \quad \text{Multiply.}$$

$$= \frac{4}{6} - \frac{1}{6}$$

$$= \frac{3}{6} \quad \text{Subtract.}$$

$$= \frac{1}{2} \quad \text{Simplify.}$$

**Try These Together**

**1.** Add  $\frac{1}{8} + \frac{5}{8}$ .

*HINT: These have a common denominator already.*

**2.** Subtract  $\frac{5}{16} - \frac{1}{4}$ .

*HINT: The LCD is 16.*

**PRACTICE**

Add or subtract. Write each sum or difference in simplest form.

**3.**  $\frac{5}{7} - \frac{2}{3}$

**4.**  $\frac{1}{6} + \frac{3}{4}$

**5.**  $\frac{7}{18} + \frac{2}{9}$

**6.**  $\frac{15}{27} - \frac{1}{3}$

Solve each equation. Write the solution in simplest form.

**7.**  $\frac{1}{7} + \frac{2}{3} = y$

**8.**  $b = \frac{1}{4} + \frac{7}{10}$

**9.**  $\frac{6}{15} + \frac{1}{2} = g$

**10.**  $h = \frac{5}{9} - \frac{1}{4}$

**11. Cooking** A recipe calls for  $\frac{1}{2}$  pound of chocolate chips and  $\frac{1}{4}$  pound of butterscotch chips. How many pounds of chips does it call for all together?

**12. Standardized Test Practice** Mr. Jensen is a flight attendant.  $\frac{1}{4}$  of his

uniforms are black and  $\frac{5}{14}$  of his uniforms are red. What fraction of his uniforms are black or red?

**A**  $\frac{9}{20}$

**B**  $\frac{2}{3}$

**C**  $\frac{6}{18}$

**D**  $\frac{17}{28}$

**6-3****Adding and Subtracting Mixed Numbers**

(pages 248–251)

You can add or subtract mixed numbers with steps similar to those you used for adding or subtracting fractions.

**Adding and Subtracting Mixed Numbers**

To add or subtract mixed numbers:

- Add or subtract the fraction parts, renaming them if necessary.
- Add or subtract the whole numbers and simplify.

**EXAMPLE**Subtract  $3\frac{1}{4} - 2\frac{5}{8}$ .

$$3\frac{1}{4} - 2\frac{5}{8} = 3\frac{2}{8} - 2\frac{5}{8}$$

The LCD is 8.

$$= 2\frac{8}{8} + \frac{2}{8} - 2\frac{5}{8}$$

Rename, since you cannot subtract  $\frac{5}{8}$  from  $\frac{2}{8}$ .

$$= 2\frac{10}{8} - 2\frac{5}{8}$$

$$= \frac{5}{8}$$

Subtract.  $\frac{10}{8} - \frac{5}{8} = \frac{5}{8}$ ,  $2 - 2 = 0$ **Try These Together**

1. Complete:  $2\frac{1}{5} = 1\frac{\square}{5}$ .

2. Complete:  $4\frac{5}{8} = 3\frac{\square}{8}$ .

HINT:  $2\frac{1}{5}$  is  $1 + 1 + \frac{1}{5}$ . How many fifths is 1?

HINT: How many eighths is 1?

**PRACTICE****Complete.**

3.  $8\frac{1}{6} = 7\frac{\square}{6}$

4.  $6\frac{10}{7} = 7\frac{\square}{7}$

5.  $5\frac{2}{3} = 4\frac{\square}{3}$

6.  $8\frac{7}{5} = \square\frac{2}{5}$


**Add or subtract. Write each sum or difference in simplest form.**

7.  $3\frac{5}{8} + 1\frac{1}{8}$

8.  $7\frac{3}{5} - 5\frac{2}{5}$

9.  $2\frac{4}{9} + 4\frac{1}{3}$

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


**11. Standardized Test Practice** Dierdre cut off and discarded  $3\frac{1}{8}$  inches

from a  $12\frac{1}{2}$ -inch-long piece of wrapping paper to wrap a gift. How long was the piece of wrapping paper she used?

**A**  $16\frac{3}{8}$  inches

**B**  $9\frac{3}{8}$  inches

**C**  $15\frac{5}{8}$  inches

**D**  $10\frac{1}{8}$  inches

**6-4****Multiplying Fractions and Mixed Numbers**

(pages 254–257)

You can multiply fractions and mixed numbers that have the same or different denominators.

<b>Multiplying Fractions</b>	To multiply fractions, multiply the numerators and then multiply the denominators. $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$ ( $b$ and $d$ are not equal to 0.)
<b>Multiplying Mixed Numbers</b>	To multiply mixed numbers, rename each mixed number as an improper fraction. Then multiply the fractions.

**EXAMPLES**

**A**  $\frac{3}{4} \times \frac{2}{9}$

$$\frac{3}{4} \times \frac{2}{9} = \frac{\overset{1}{\cancel{3}}}{2\cancel{4}} \times \frac{2^{\cancel{1}}}{\overset{1}{\cancel{9}}_3}$$

The GCF of 3 and 9 is 3.  
The GCF of 2 and 4 is 2.

$$= \frac{1}{6}$$

**B**  $1\frac{1}{4} \times 3\frac{2}{5}$

$$1\frac{1}{4} \times 3\frac{2}{5} = \frac{5}{4} \times \frac{17}{5}$$

Rename the mixed numbers as improper fractions.

$$= \frac{1}{4} \times \frac{17}{1}$$

The GCF of 5 and 5 is 5.

$$= \frac{17}{4} \text{ or } 4\frac{1}{4}$$

**Try These Together**

1.  $\frac{1}{4} \times \frac{3}{5}$

*HINT: Multiply numerators and then multiply denominators.*

2.  $\frac{5}{8} \times \frac{4}{5}$

*HINT: Divide numerators and denominators by any GCFs to simplify before you multiply.*

**PRACTICE**

**Multiply.** Write each product in simplest form.

3.  $\frac{3}{7} \times \frac{1}{3}$

4.  $\frac{5}{9} \times \frac{1}{10}$

5.  $\frac{2}{11} \times \frac{1}{5}$

6.  $2\frac{1}{2} \times 1\frac{3}{4}$

7.  $\frac{9}{10} \times \frac{6}{7}$

8.  $\frac{6}{13} \times \frac{1}{2}$

9.  $\frac{5}{8} \times \frac{2}{5}$

10.  $3\frac{2}{3} \times 2\frac{1}{3}$

**Solve each equation.** Write the solution in simplest form.

11.  $1\frac{2}{5} \times 2 = r$

12.  $2\frac{1}{4} \times \frac{4}{9} = s$

13.  $4\frac{1}{2} \times \frac{1}{12} = t$

- 14. Standardized Test Practice** For a science experiment, Evan needs 3 pieces of string that are each  $5\frac{1}{2}$  inches long. How many inches of string does he need total?

**A**  $66\frac{1}{4}$

**B**  $33\frac{1}{4}$

**C**  $15\frac{1}{2}$

**D**  $16\frac{1}{2}$

