Chapter 5
Resource Masters

GLENCOE MATHEMATICS

Mathematics

Applications and Concepts

Course 2

Glencoe

New York, New York Columbus, Ohio Chicago, Illinois Peoria, Illinois Woodland Hills, California

NAME _____ DATE _____ PERIOD _____

5-1 Study Guide and Intervention

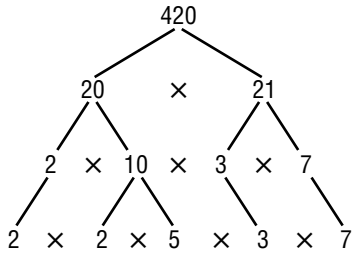
Prime Factorization

A **prime number** is a whole number greater than 1 that has exactly two factors, 1 and itself. A whole number greater than 1 that has more than two factors is a **composite number**. Every composite number can be written as the product of prime numbers in exactly one way. This is called the **prime factorization** of the number.

EXAMPLE 1 **Determine whether 21 is *prime* or *composite*.**

The number 21 has four factors: 1, 3, 7, and 21. So, it is composite.

EXAMPLE 2 **Find the prime factorization of 420.**



Write 420 as the product of two factors.

Keep factoring until all of the factors are prime numbers.

The prime factorization of 420 is $2 \times 2 \times 5 \times 3 \times 7$, or $2^2 \times 3 \times 5 \times 7$.

EXERCISES

Determine whether each number is *prime* or *composite*.

1. 97 **2.** 91 **3.** 327

Find the prime factorization of each number.

4. 60 **5.** 441 **6.** 140

7. 450 **8.** 156 **9.** 216

Lesson 5–1

NAME _____ DATE _____ PERIOD _____

5-1 Practice: Skills

Prime Factorization

Determine whether each number is *prime* or *composite*.

1. 34

2. 77

3. 37

4. 89

5. 69

6. 67

7. 123

8. 71

9. 2

10. 45

11. 29

12. 90

Find the prime factorization of each number.

13. 48

14. 54

15. 108

16. 80

17. 125

18. 66

19. 250

20. 187

21. 242

Write each expression as a product of its factors.

22. $56ab$

23. $24bc$

24. $147abc$

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5-1 Practice: Word Problems

Prime Factorization

1. FLAG When the United States had 48 states, the stars were arranged in a 6×8 rectangular arrangement. What other rectangular arrangements of 48 stars are possible?	**2. MARCHING BAND** A marching band has 72 members. If they are to march with an equal number of people in each row, state all possible numbers of rows and numbers of people in each row.
3. BIOLOGY The human face uses 14 muscles to smile and 43 to frown. Which number is prime and which is composite? Explain.	**4. BASEBALL CARDS** Jack is arranging his prized baseball cards in a frame. If he has 24 cards, in how many different numbers of rows and columns can he display them if each row has the same number of cards?
5. HISTORY It is estimated that Sophocles, an ancient Greek dramatist, died in 406 B.C. Find the prime factorization of 406.	**6. ANATOMY** There are 230 joints in the human body. Find the prime factorization of 230.
7. PHOTOS Bill is arranging 108 photos to display on a poster board for a presentation. If he arranges an equal number of photos in each row, in how many different numbers of rows and columns can he arrange the photos?	**8. ART** The supreme example of Renaissance genius, Leonardo da Vinci, passed away in 1519 A.D. Is 1519 a composite or prime number? Explain.

Lesson 5–1

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5-1 Reading to Learn Mathematics

Prime Factorization

Pre-Activity

Complete the Mini Lab at the top of page 197 in your textbook. Write your answers below.

1. Using your grid paper, draw as many different rectangles as possible using 3, 4, 5, 6, 7, 8, 9, and 10 squares.

2. Which numbers of squares can be drawn in only one rectangle? In more than one rectangle?

Reading the Lesson

3. How do you know when you are at the bottom of a factor tree?

4. Does the order of the factors in a prime factorization matter?

5. What does the bottom row of the factor tree look like for the prime factorization of $45xy^2$?

Helping You Remember

6. A factor tree can be used to find the prime factorization of a composite number. Why do you think it is called a factor *tree*? What are the "leaves" of the tree?

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5-1

Enrichment

Perfect Numbers

A positive integer is *perfect* if it equals the sum of its factors that are less than the integer itself.

If the sum of the factors (excluding the integer itself) is greater than the integer, the integer is called *abundant*.

If the sum of the factors (excluding the integer itself) is less than the integer, the integer is called *deficient*.

The factors of 28 (excluding 28 itself) are 1, 2, 4, 7, and 14.
Since $1 + 2 + 4 + 7 + 14 = 28$, 28 is a perfect number.

Complete the table to classify each number as perfect, abundant, or deficient.

	Number	Divisors (Excluding the Number Itself)	Sum	Classification
1.	14			
2.	6			
3.	12			
4.	20			
5.	10			

Show that each number is perfect.

6. 496

7. 8,128

8. CHALLENGE 33,550,336

Lesson 5–1

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5-2 Study Guide and Intervention

Greatest Common Factor

The **greatest common factor (GCF)** of two or more numbers is the largest number that is a factor of each number. The GCF of prime numbers is 1.

EXAMPLE 1 **Find the GCF of 72 and 108 by listing factors.**

factors of 72: 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

factors of 108: 1, 2, 3, 4, 6, 9, 12, 18, 27, 36, 54, 108

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

The GCF of 72 and 108 is 36.

EXAMPLE 2 **Find the GCF of 42 and 60 using prime factors.**

Method 1 Write the prime factorization.

$60 = 2 \times \boxed{2} \times \boxed{3} \times 5$

$42 = \quad \boxed{2} \times \boxed{3} \times 7$

Method 2 Divide by prime numbers.
Divide both 42 and 60 by 2.
Then divide the quotients by 3.

$$\begin{array}{r} 7 \quad 10 \\ 3\overline{)21 \quad 30} \\ 2\overline{)42 \quad 60} \end{array} \leftarrow \text{Start here.}$$

The common prime factors are 2 and 3. The GCF of 42 and 60 is 2×3, or 6.

EXERCISES

Find the GCF of each set of numbers.

1. 18, 30

2. 60, 45

3. 24, 72

4. 32, 48

5. 100, 30

6. 54, 36

7. 3, 97, 5

8. 4, 20, 24

9. 36, 9, 45

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5-2 Practice: Skills

Greatest Common Factor

Find the GCF of each set of numbers.

1. 14, 20

2. 16, 42

3. 8, 18

4. 24, 36

5. 72, 22

6. 77, 15

7. 32, 80

8. 90, 120

9. 45, 30

10. 12, 62

11. 15, 27

12. 21, 28

13. 12, 20, 26

14. 15, 20, 25

15. 60, 72, 36

16. 32, 48, 64

17. 36, 48, 30

18. 28, 56, 42

19. 80, 110, 90

20. 9, 25, 49

Find the GCF of each set of algebraic expressions.

21. $21ab$, $14b$

22. $20a^2$, $36a$

23. $15ab$, $5b^2$

24. $35a^2$, $85ab$

25. Find the GCF of $2^3 \times 3^2 \times 5$ and $2^2 \times 3 \times 5^2$.

Lesson 5–2

NAME _____ DATE _____ PERIOD _____

5-2 Practice: Word Problems

Greatest Common Factor

1. TABLE TENNIS Rebecca has 20 table tennis balls and 16 table tennis paddles. She wants to sell packages of balls and paddles bundled together. What is the greatest number of packages she can sell with no leftover balls or paddles?	**2. TUMBLING** Mr. Nicolet wants to organize equal-sized groups of boys and girls for tumbling exercises. If there are 12 boys and 18 girls and each group is all boys or all girls, what is the largest size group he can organize?
3. BAKE SALE Volunteers at a bake sale want to sell slices of banana nut bread and raisin bread packaged together. They have 63 slices of banana nut bread and 45 slices of raisin bread, and they plan to use all the bread. What is the greatest number of packages they can put together? How many slices of each type of bread are in a package?	**4. DOG TREATS** Krista wants to give her dog a special treat. She has 81 dog bones and 54 pieces of beef jerky. If she wants to give her dog the same number of treats every day, what is the greatest number of days she can feed the dog these treats? How many of each type should she give the dog?
5. FRUIT TREES Mr. Farber has 84 pear trees and 180 apple trees. He wants to plant the trees in rows of equal width. Find the most trees that can be planted in a row if each row has only one type of tree.	**6. BOARDS** A scouting troop has three boards of lengths 14 feet, 28 feet, and 21 feet. If the boards must be cut to produce equal-sized pieces, what is the longest piece that can be cut with no waste?

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5-2 Reading to Learn Mathematics

Greatest Common Factor

Pre-Activity

Read the introduction at the top of page 203 in your textbook. Write your answers below.

1. Who visited the Fashion Chat Room?

2. Who visited the Music Chat Room?

3. Who visited both chat rooms?

Reading the Lesson

4. What does a Venn diagram show?

5. How does a Venn diagram show relationships between elements?

6. You can find the GCF by using common factors or using common prime factors. What is the difference?

7. Find the prime factors of 20 and 24. What are the prime factors that are common to both numbers? What is the GCF?

8. How is the GCF of two numbers found if you know the prime factors common to the numbers?

Helping You Remember

9. In your own words, describe what the GCF of two numbers is and explain one way to find it.

Lesson 5–2

NAME _____ DATE _____ PERIOD _____

5-2 Enrichment

Sundaram's Sieve

This arrangement of numbers is called Sundaram's Sieve. Like the Sieve of Eratosthenes, Sundaram's arrangement can be used to find prime numbers.

4	7	10	13	16	19	22	25	28	31
7	12	17	22	27	32	37	42	47	52
10	17	24	31	38	45	52	59	66	73
13	22	31	40	49	58	67	76	85	94
16	27	38	49	60	71	82	93	104	115

Here's how to use Sundaram's Sieve to find prime numbers. If a number, n, is not in the Sieve, then $2n + 1$ is a prime number. If a number, n, is in the Sieve, then $2n + 1$ is not a prime number.

32 is in the sieve. $2 \times 32 + 1 = 65$ 65 is not prime.

35 is not in the sieve. $2 \times 35 + 1 = 71$ 71 is prime.

1. Does the sieve give all primes up to 99? all the composites?

2. Sundaram's Sieve is constructed from arithmetic sequences. Describe the pattern used to make the first row.

3. How is the first column constructed?

4. How are the second through fifth rows constructed?

5. How would you add a sixth row to the sieve?

6. Use Sundaram's Sieve to find 5 four-digit prime numbers. You will need to add more numbers to the sieve to do this.

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5-3 Study Guide and Intervention

Simplifying Fractions

Fractions that have the same value are called **equivalent fractions**. A fraction is in **simplest form** when the GCF of the numerator and denominator is 1.

EXAMPLE 1 **Write $\frac{36}{54}$ in simplest form.**

First, find the GCF of the numerator and denominator.
factors of 36: 1, 2, 3, 4, 6, 9, 12, 18, 36
factors of 54: 1, 2, 3, 6, 9, 18, 27, 54
The GCF of 36 and 54 is 18.

Then, divide the numerator and the denominator by the GCF.

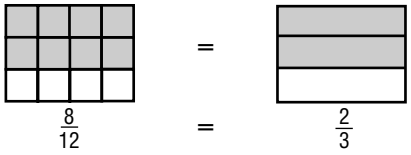
$\frac{36}{54} = \frac{36 \div 18}{54 \div 18} = \frac{2}{3}$ So, $\frac{36}{54}$ written in simplest form is $\frac{2}{3}$.

EXAMPLE 2 **Write $\frac{8}{12}$ in simplest form.**

$8 = (2) \cdot (2) \cdot 2$
$12 = (2) \cdot (2) \cdot 3$

GCF: $2 \cdot 2 = 4$

$\frac{8}{12} = \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$



$\frac{8}{12}$ $\frac{2}{3}$

So, $\frac{8}{12}$ written in simplest form is $\frac{2}{3}$.

EXERCISES

Write each fraction in simplest form.

1. $\frac{42}{72}$ **2.** $\frac{40}{64}$ **3.** $\frac{21}{35}$

4. $\frac{25}{100}$ **5.** $\frac{99}{132}$ **6.** $\frac{17}{85}$

Lesson 5–3

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5-3 Practice: Skills

Simplifying Fractions

Write each fraction in simplest form.

1. $\frac{49}{70}$ **2.** $\frac{5}{30}$ **3.** $\frac{6}{14}$

4. $\frac{14}{28}$ **5.** $\frac{72}{72}$ **6.** $\frac{18}{21}$

7. $\frac{45}{75}$ **8.** $\frac{50}{200}$ **9.** $\frac{32}{50}$

10. $\frac{56}{64}$ **11.** $\frac{14}{35}$ **12.** $\frac{39}{45}$

13. $\frac{48}{66}$ **14.** $\frac{42}{45}$ **15.** $\frac{78}{130}$

Write two fractions that are equivalent to each fraction.

16. $\frac{3}{4}$ **17.** $\frac{7}{9}$ **18.** $\frac{7}{11}$

19. $\frac{14}{17}$ **20.** $\frac{21}{23}$ **21.** $\frac{11}{17}$

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5-3

Practice: Word Problems

Simplifying Fractions

1. EXAM Mr. Bonilla gave an exam and 20 out of 25 students passed the exam. What fraction of the students passed the exam? Write the answer in simplest form.	**2. GASOLINE** Aisha filled her car's 24-gallon gas tank. She took a short trip and used 8 gallons of gas. What fraction of the full gas tank was used on the trip? Write the answer in simplest form.
3. BICYCLES A local community college has 860 students. Of these 860 students, 220 ride bicycles. Write the number of bike riders as a fraction of the number of students at the college in simplest form.	**4. PRESIDENTS** Of the first 22 presidents, 8 were from New York. Write the number of presidents from New York as a fraction of the first 22 presidents in simplest form.
5. TIME Ten hours is what part of a day? Write the fraction in simplest form.	**6. MEASUREMENT** Eighteen inches is what part of a yard? Write the fraction in simplest form.

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5-3

Reading to Learn Mathematics

Simplifying Fractions

Pre-Activity ***Complete the Mini Lab at the top of page 207 in your textbook. Write your answers below.***

1. Write a fraction to describe each figure above: $\frac{\text{number of shaded parts}}{\text{total number of parts}}$.

2. Which figure has a greater portion of its parts shaded?

3. What can you conclude about the fractions you wrote above?

Reading the Lesson

4. How do you find the simplest form of a fraction?

5. When you find the simplest form of a fraction, how can you check to make sure your answer is correct?

6. Use canceling to simplify the fraction $\frac{2 \times 3 \times 7 \times 11}{3 \times 11 \times 17}$.

Helping You Remember

7. Use a collection of rectangles like the one in the Mini Lab to show how to write $\frac{15}{25}$ in simplest form.

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5-3 Enrichment

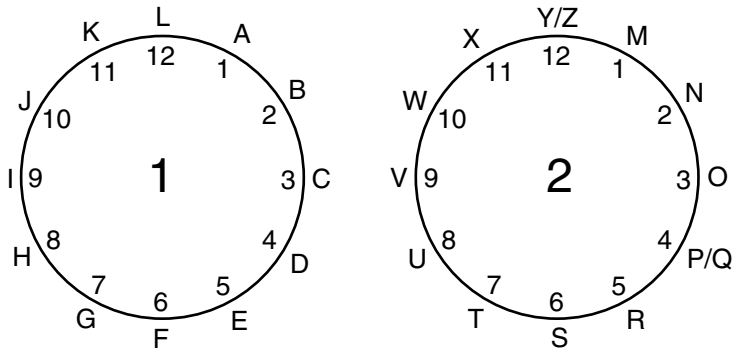
A Two-Clock Code

Two clock faces can be used to create coded secret messages.

To encode a message, write each letter of the message as a fraction. Use the hour next to the letter as the denominator and the number in the center of that clock as the numerator.

For example, the letter G will be encoded as the fraction $\frac{1}{7}$. The letter R becomes $\frac{2}{5}$.

Notice the Y and Z are both written with the same fraction. The same is true for P and Q.



1. Decode this message. The result will be a "secret" from a well-known poem written by Henry Wadsworth Longfellow.

$\frac{1}{9}\ \frac{1}{6}\ \frac{2}{7}\ \frac{1}{8}\ \frac{1}{5}\ \frac{1}{2}\ \frac{2}{5}\ \frac{1}{9}\ \frac{2}{7}\ \frac{1}{9}\ \frac{2}{6}\ \frac{1}{8}\ \frac{2}{1}\ \frac{1}{1}\ \frac{2}{5}\ \frac{1}{3}\ \frac{1}{8}\ \frac{1}{2}\ \frac{2}{12}\ \frac{1}{12}\ \frac{1}{1}\ \frac{2}{2}\ \frac{1}{4}\ \frac{2}{3}\ \frac{2}{5}\ \frac{2}{6}\ \frac{1}{5}\ \frac{1}{1}$

$\frac{1}{6}\ \frac{2}{5}\ \frac{2}{3}\ \frac{2}{1}\ \frac{2}{7}\ \frac{1}{8}\ \frac{1}{5}\ \frac{2}{7}\ \frac{2}{3}\ \frac{2}{10}\ \frac{2}{2}\ \frac{2}{7}\ \frac{2}{3}\ \frac{2}{2}\ \frac{1}{9}\ \frac{1}{7}\ \frac{1}{8}\ \frac{2}{7}\ \frac{1}{8}\ \frac{1}{1}\ \frac{2}{2}\ \frac{1}{7}\ \frac{1}{1}$

$\frac{1}{12}\ \frac{1}{1}\ \frac{2}{2}\ \frac{2}{7}\ \frac{1}{5}\ \frac{2}{5}\ \frac{2}{2}\ \frac{1}{1}\ \frac{1}{12}\ \frac{2}{3}\ \frac{1}{6}\ \frac{2}{7}\ \frac{1}{9}\ \frac{2}{2}\ \frac{2}{7}\ \frac{1}{8}\ \frac{1}{5}\ \frac{1}{2}\ \frac{1}{5}\ \frac{1}{12}\ \frac{1}{6}\ \frac{2}{5}\ \frac{2}{12}\ \frac{1}{1}\ \frac{2}{5}\ \frac{1}{3}\ \frac{1}{8}$

$\frac{2}{3}\ \frac{1}{6}\ \frac{2}{7}\ \frac{1}{8}\ \frac{1}{5}\ \frac{2}{2}\ \frac{2}{3}\ \frac{2}{5}\ \frac{2}{7}\ \frac{1}{8}\ \frac{1}{3}\ \frac{1}{8}\ \frac{2}{8}\ \frac{2}{5}\ \frac{1}{3}\ \frac{1}{8}\ \frac{2}{7}\ \frac{2}{3}\ \frac{2}{10}\ \frac{1}{5}\ \frac{2}{5}\ \frac{1}{1}\ \frac{2}{6}\ \frac{1}{1}\ \frac{2}{6}\ \frac{1}{9}\ \frac{1}{7}\ \frac{2}{2}\ \frac{1}{1}\ \frac{1}{12}$

$\frac{1}{12}\ \frac{1}{9}\ \frac{1}{7}\ \frac{1}{8}\ \frac{2}{7}\ \frac{2}{3}\ \frac{2}{2}\ \frac{1}{5}\ \frac{1}{9}\ \frac{1}{6}\ \frac{1}{2}\ \frac{2}{12}\ \frac{1}{12}\ \frac{1}{1}\ \frac{2}{2}\ \frac{1}{4}\ \frac{1}{1}\ \frac{2}{2}\ \frac{1}{4}\ \frac{2}{7}\ \frac{2}{10}\ \frac{2}{3}\ \frac{1}{9}\ \frac{1}{6}\ \frac{1}{2}\ \frac{2}{12}\ \frac{2}{6}\ \frac{1}{5}\ \frac{1}{1}$

2. Use the two-clock code to create a secret message of your own.

Lesson 5–3

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5-4 Study Guide and Intervention

Fractions and Decimals

To write a decimal as a fraction, divide the numerator of the fraction by the denominator. Use a power of ten to change a decimal to a fraction.

EXAMPLE 1 **Write $\frac{5}{9}$ as a decimal.**

Method 1 Use pencil and paper.

$$\begin{array}{r} 0.555\ldots \\ 9\overline{)5.000} \\ \underline{4\ 5} \\ 50 \\ \underline{45} \\ 50 \\ \underline{45} \\ 5 \end{array}$$

The remainder after each step is 5.

Method 2 Use a calculator.

5 ÷ 9 = 0.55555556

You can use bar notation $0.\overline{5}$ to indicate that 5 repeats forever. So, $\frac{5}{9} = 0.\overline{5}$.

EXAMPLE 2 **Write 0.32 as a fraction in simplest form.**

$0.32 = \frac{32}{100}$ The 2 is in the hundredths place.

$= \frac{8}{25}$ Simplify.

EXERCISES

Write each fraction or mixed number as a decimal. Use bar notation if the decimal is a repeating decimal.

1. $\frac{8}{10}$ **2.** $\frac{3}{5}$ **3.** $\frac{7}{11}$

4. $4\frac{7}{8}$ **5.** $\frac{13}{15}$ **6.** $3\frac{47}{99}$

Write each decimal as a fraction in simplest form.

7. 0.14 **8.** 0.3 **9.** 0.94

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5-4 Practice: Skills

Fractions and Decimals

Write each repeating decimal using bar notation.

1. 0.7353535...

2. 0.424242...

3. 5.126126126...

Write each fraction or mixed number as a decimal. Use bar notation if the decimal is a repeating decimal.

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

5. $\frac{19}{20}$

6. $3\frac{4}{5}$

7. $\frac{23}{50}$

8. $1\frac{5}{8}$

9. $\frac{19}{25}$

10. $4\frac{17}{37}$

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

12. $\frac{17}{24}$

13. $6\frac{7}{32}$

14. $7\frac{9}{22}$

15. $1\frac{17}{48}$

Write each decimal as a fraction in simplest form.

16. 0.8

17. 0.52

18. 0.92

19. 0.48

20. 0.86

21. 0.76

Lesson 5–4

NAME _____ DATE _____ PERIOD _____

5-4

Practice: Word Problems

Fractions and Decimals

1. BOYS AND GIRLS There were 6 girls and 18 boys in Mrs. Johnson's math class. Write the number of girls as a fraction of the number of boys. Then write the fraction as a repeating decimal.	**2. CATS** In a neighborhood of 72 families, 18 families own one or more cats. Write the number of families who own one or more cats as a fraction. Then write the fraction as a decimal.
3. CELLULAR PHONES In Italy, about 74 of every 100 people use cellular telephones. Write the fraction of cellular phone users in Italy. Then write the fraction as a decimal.	**4. FRUITS** Ms. Rockwell surveyed her class and found that 12 out of the 30 students chose peaches as their favorite fruit. Write the number of students who chose peaches as a fraction in simplest form. Then write the fraction as a decimal.
5. TRAVEL Tora took a short trip of 320 miles. He stopped to have lunch after he had driven 120 miles. Write the fraction of the trip he had completed by lunch in simplest form. Then write the fraction as a decimal.	**6. VOTING** In a recent school election, 208 of the 325 freshmen voted in their class election. Write the fraction of freshmen who voted. Then write the fraction as a decimal.

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5-4 Reading to Learn Mathematics

Fractions and Decimals

Pre-Activity

Read the introduction at the top of page 210 in your textbook. Write your answers below.

1. How many games did the USA softball team win? How many did they play?

2. Write a fraction comparing the number of times the team won to the total number of games played.

Reading the Lesson

3. What is meant by the term *place value*?

4. In place value, what serves as the divider between ones and tenths?

5. What is the difference between a terminating decimal and a repeating decimal? Give an example of each.

Helping You Remember

6. Work with a partner. Use a local newspaper, a favorite magazine, or the Internet. Find real-world situations that use fractions or decimals. Convert the fractions to decimals and the decimals to fractions. Exchange papers with your partner and correct each other's work.

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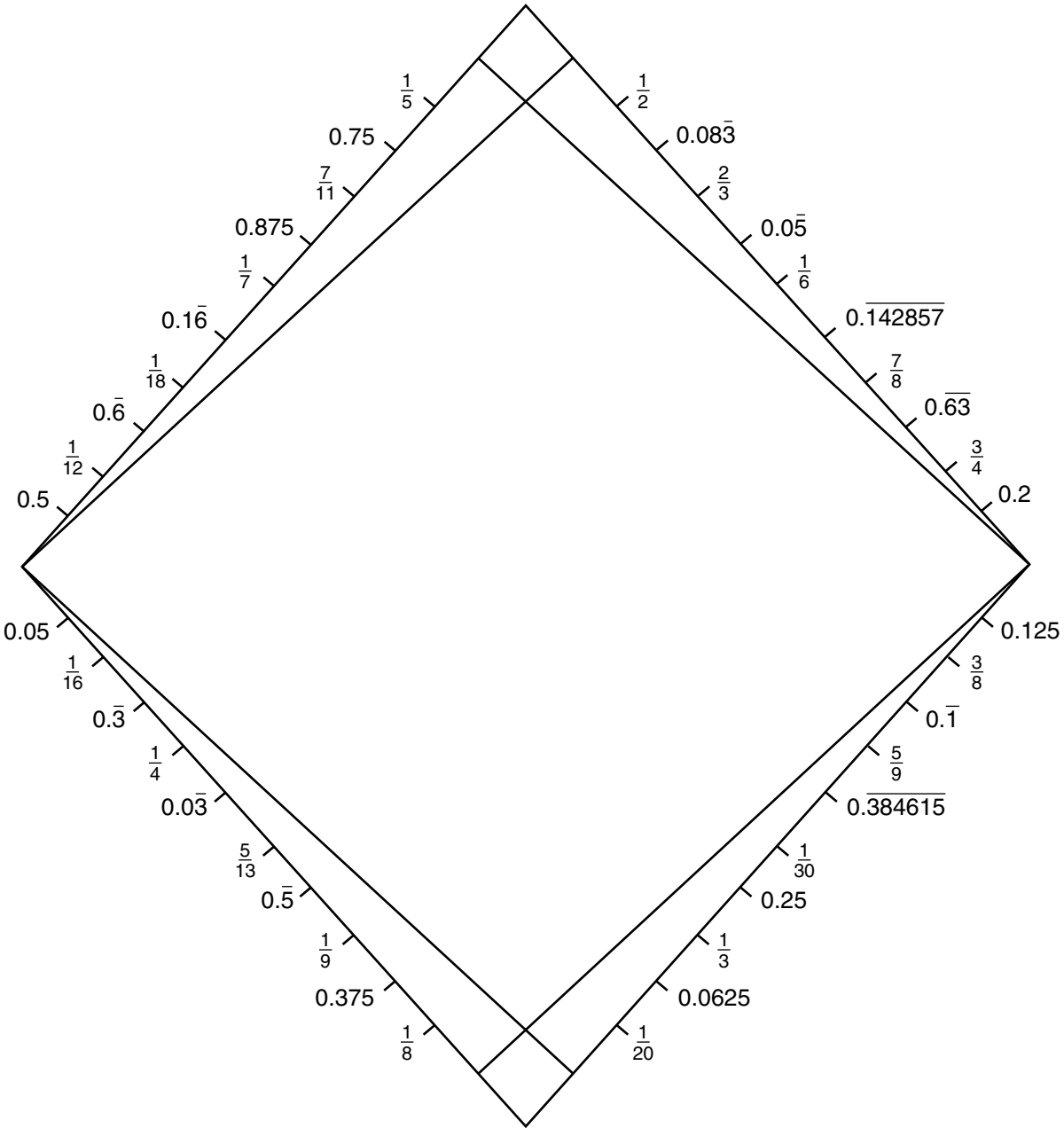
5-4 Enrichment

Making a Line Design

Connect each pair of equivalent numbers with a straight line segment. Although you will draw only straight lines, the finished design will appear curved!



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5-5 Study Guide and Intervention

Fractions and Percents

A **ratio** is a comparison of two numbers by division. When a ratio compares a number to 100, it can be written as a **percent**. To write a ratio or fraction as a percent, find an equivalent fraction with a denominator of 100. You can also use the meaning of percent to change percents to fractions.

EXAMPLE 1 **Write $\frac{19}{20}$ as a percent.**

$\frac{19}{20} \xrightarrow{\times 5} \frac{95}{100} = 95\%$ Since $100 \div 20 = 5$, multiply the numerator and denominator by 5.

EXAMPLE 2 **Write 92% as a fraction in simplest form.**

$92\% = \frac{92}{100}$ Definition of percent

$= \frac{23}{25}$ Simplify.

EXERCISES

Write each ratio as a percent.

1. $\frac{14}{100}$ **2.** $\frac{27}{100}$ **3.** 34.5 per 100

4. 18 per 100 **5.** 21:100 **6.** 96:100

Write each fraction as a percent.

7. $\frac{3}{100}$ **8.** $\frac{14}{100}$ **9.** $\frac{2}{5}$

10. $\frac{1}{20}$ **11.** $\frac{13}{25}$ **12.** $\frac{4}{10}$

Write each percent as a fraction in simplest form.

13. 35% **14.** 18% **15.** 75%

16. 80% **17.** 16% **18.** 15%

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5-5 Practice: Skills

Fractions and Percents

Write each ratio as a percent.

1. 26 out of 100

2. 5 per 100

3. 13:100

4. $\frac{39}{100}$

5. 12.5 per 100

6. 51 out of 100

Write each fraction as a percent.

7. $\frac{7}{10}$

8. $\frac{6}{50}$

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

10. $\frac{30}{50}$

11. $\frac{7}{20}$

12. $\frac{12}{20}$

13. $\frac{23}{25}$

14. $\frac{3}{10}$

15. $\frac{17}{50}$

Write each percent as a fraction in simplest form.

16. 15%

17. 85%

18. 1%

19. 70%

20. 25%

21. 19%

22. 33%

23. 22%

24. 95%

NAME _____ DATE _____ PERIOD _____

5-5

Practice: Word Problems

Fractions and Percents

1. LUNCHES Three out of every 10 students in Mr. Chan's class bring their lunch to school. Write this ratio as a percent.	**2. COMPUTERS** In 2000, 57 out of every 100 school age children (ages 6 to 17 years) had access to a computer both at home and at school. Write this ratio as a percent.
3. SALES TAX In one town, the sales tax is 8%. Write this percent as a fraction in simplest form.	**4. HYGEINE** Ms. Agosto surveyed her class and found that 15 out of 30 students brushed their teeth more than twice a day. What percent of students brushed more than twice a day?
5. DISCOUNT A local retail store was having a sale and offered all their merchandise at a 25% discount. Write this percent as a fraction in simplest form.	**6. SPACE FLIGHT** About 64% of all individuals who have flown in space from 1961 to 2001 are from the United States. Write this percent as a fraction in simplest form.

NAME _____ DATE _____ PERIOD _____

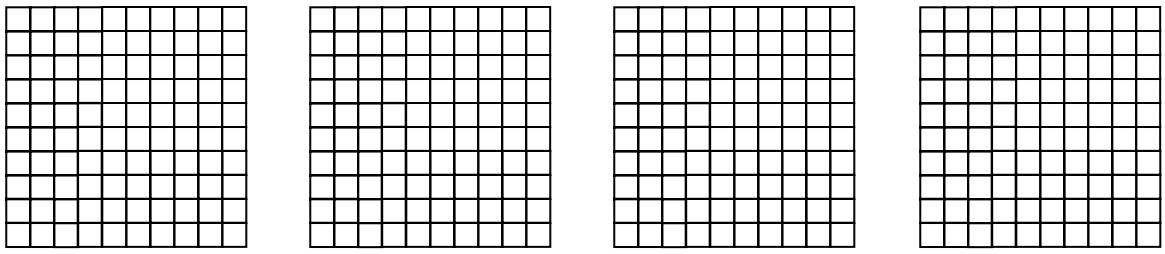
5-5 Reading to Learn Mathematics

Fractions and Percents

Pre-Activity

Read the introduction at the top of page 216 in your textbook. Write your answers below.

1. Shade a 10×10 grid that represents the number of students that chose each method.



2. What fraction of the students chose the Internet as the method that makes learning more interesting?

Reading the Lesson

3. There is more than one way to write a ratio. Write the ratio that compares 4 to 25 in three different ways.

4. Write the ratio in Exercise 3 as a percent.

5. How does having ratios written as percents make it easier to compare amounts?

Helping You Remember

6. Work with a partner. Explain to your partner how to convert a ratio that does *not* compare a number to 100 as a percent. Then have your partner explain to you how to change from a percent to a fraction in simplest form. Both of you should use examples as well as general explanations.

NAME _____ DATE _____ PERIOD _____

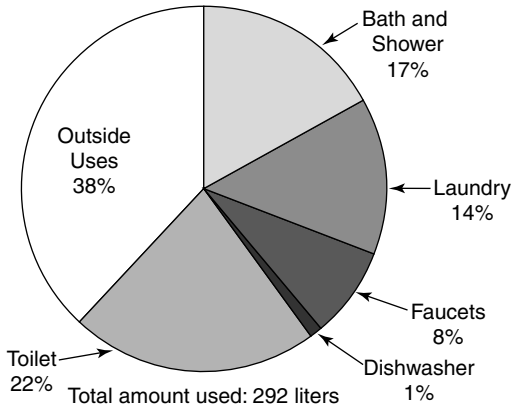
5-5 Enrichment

Margarita Colmenares

Margarita Colmenares is an environmental engineer. She is a native of Los Angeles and a 1981 graduate of Stanford University. In 1989, she became the first woman president of the Society of Hispanic Professional Engineers. Ms. Colmenares was recently appointed to direct an office at the U.S. Department of Education. She has a special interest in education and has traveled extensively to talk to student groups about careers in engineering.

Environmental engineers like Colmenares use mathematics to predict the effect that our actions will have on our environment. They may also recommend ways to protect the environment. On this page, you will consider some data and recommendations concerning water usage.

Daily Water Usage in the United States (Per Person)



Refer to the graph above.

1. Which one category accounts for more than $\frac{1}{3}$ of the water usage?

2. Estimate the fraction of a person's daily water usage that is for bath and shower.

Use the graph above. Estimate the amount of water used in each category.

3. outside uses

4. bath and shower

5. toilet

6. laundry

7. dishwasher

8. faucets

In each situation, what percent of the water used can be saved by following the recommendation?

9. Using a water-saving shower head can save 65 liters of water out of the 130 liters normally used in a five-minute shower.

10. Turning off the water while brushing your teeth can reduce the water used from 20 liters to 2 liters.

NAME _____ DATE _____ PERIOD _____

5-6 Study Guide and Intervention

Percents and Decimals

To write a percent as a decimal, divide the percent by 100 and remove the percent symbol. To write a decimal as a percent, multiply the decimal by 100 and add the percent symbol.

EXAMPLE 1 **Write 42.5% as a decimal.**

$42.5\% = \frac{42.5}{100}$ Write the percent as a fraction.

$= \frac{42.5 \times 10}{100 \times 10}$ Multiply by 10 to remove the decimal in the numerator.

$= \frac{425}{1{,}000}$ Simplify.

$= 0.425$ Write the fraction as a decimal.

EXAMPLE 2 **Write 0.625 as a percent.**

$0.625 = 062.5$ Multiply by 100.

$= 62.5\%$ Add the % symbol.

EXERCISES

Write each percent as a decimal.

1. 6%

2. 28%

3. 81%

4. 84%

5. 35.5%

6. 12.5%

7. 14.2%

8. 11.1%

Write each decimal as a percent.

9. 0.47

10. 0.03

11. 0.075

12. 0.914

NAME _____ DATE _____ PERIOD _____

5-6 Practice: Skills

Percents and Decimals

Write each percent as a decimal.

1. 5%

2. 20%

3. 21%

4. 83%

5. 7%

6. 56%

7. 16%

8. 45%

9. 27.3%

10. 14.9%

11. 91.5%

12. 29.3%

13. 14.4%

14. 80%

15. 7.5%

16. $10\frac{1}{2}\%$

Write each decimal as a percent.

17. 0.06

18. 0.13

19. 0.5

20. 0.74

21. 0.14

22. 0.92

23. 0.54

24. 0.66

25. 0.192

26. 0.295

27. 0.911

28. 0.247

29. 0.4165

30. 0.2199

31. 0.7601

32. 0.4833

Lesson 5–6

NAME _____ DATE _____ PERIOD _____

5-6 Practice: Word Problems

Percents and Decimals

1. AREA New Mexico's land area is about 0.03 of the total area of the United States. What percent is New Mexico's land area of the total area of the United States?	**2. SCALE MODEL** A scale model of a building is 0.25 the actual size. What percent of the actual size of the building is the model?
3. NFL COACHES Don Shula ranks among the most successful coaches in the National Football League. In his career, he won 0.665 of his games. Write the decimal as a percent.	**4. SOFTBALL** Jenny's batting average is 0.346. Write the decimal as a percent.
5. VITAMINS A multiple vitamin contains 450 milligrams of calcium. This is 45% of the recommended daily allowance. Write the percent as a decimal.	**6. BASKETBALL** Tao makes 74% of his free throws. Write the percent as a decimal.
7. SALES TAX The sales tax in a town is 7.25%. Write the percent as a decimal.	**8. FIELD TRIP** In Ms. Silver's English class, $20\frac{1}{4}\%$ of the students signed up to visit a local museum. Write the percent as a decimal.

NAME _____ DATE _____ PERIOD _____

5-6 Reading to Learn Mathematics

Percents and Decimals

Pre-Activity

Read the introduction at the top of page 220 in your textbook. Write your answers below.

1. Write the percent of students who read for fun as a fraction.

2. Write the fraction as a decimal.

Reading the Lesson

3. Describe each step in changing a percent to a fraction.

4. Describe each step in changing a percent to a decimal by first writing the percent as a fraction.

5. Describe how to write a percent as a decimal without writing the percent as a fraction.

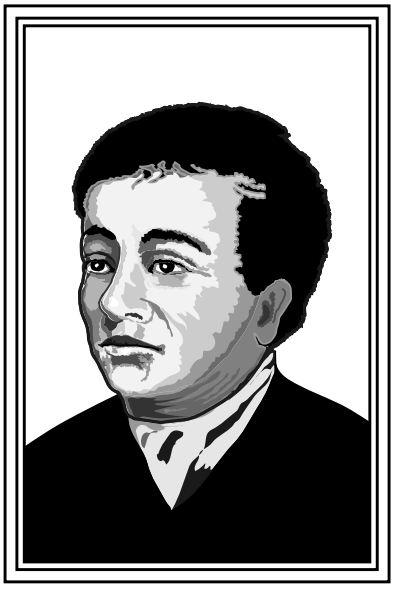
Helping You Remember

6. Work with a partner. Think of a way that will help you remember which way to move the decimal when you go from a percent to a decimal and which way to move it when you go from a decimal to a percent.

NAME _____ DATE _____ PERIOD _____

5-6 Enrichment

African-American Scientists and Inventors



When you buy a pair of shoes, you usually have a wide variety of styles, sizes, and prices to choose from. It is the work of an African-American inventor, Jan Matzeliger (1852–1889), that makes this possible. In 1882, Matzeliger patented a *lasting machine* that could shape the upper portion of a shoe and attach it to the sole in a fraction of the time it took to do the job by hand. Using this machine, shoe manufacturers were able to increase production and reduce prices dramatically.

African Americans have made many significant contributions to mathematics, science, and invention. By solving the percent problems and matching the problem and the correct solution, you will learn more about just a few of them.

Solutions		
A.	20	Benjamin Banneker
B.	21	Marjorie Lee Browne
C.	18	Lewis Latimer
D.	17.5	Jane Cooke Wright

1. 35% of 50 is what number?
This physician researched and tested chemotherapy as a method of treating cancer. In 1952, she became head of the Cancer Research Foundation at Harlem Hospital.

2. What percent of 75 is 15?
This mathematician was part of the team of surveyors who created the street plan for Washington, D.C. in the late eighteenth century.

3. 4.5% of 400 is what number?
In 1876, this engineer drew up the plans that accompanied Alexander Graham Bell's application for a patent on the telephone.

4. 120% of what number is 25.2?
In 1949, she became one of the first two African-American women to earn a doctorate in mathematics. She was head of the mathematics department at North Carolina Central University from 1951 to 1970.

NAME _____ DATE _____ PERIOD _____

5-7 Study Guide and Intervention

Least Common Multiple

A **multiple** of a number is the product of that number and any whole number. The least nonzero multiple of two or more numbers is the **least common multiple (LCM)** of the numbers.

EXAMPLE 1 **Find the LCM of 15 and 20 by listing multiples.**

List the multiples.

multiples of 15: 15, 30, 45, **60**, 75, 90, 105, **120**, ...

multiples of 20: 20, 40, **60**, 80, 100, **120**, 140, ...

Notice that 60, 120, …, are common multiples. So, the LCM of 15 and 20 is 60.

EXAMPLE 2 **Find the LCM of 8 and 12 using prime factors.**

Method 1 Write the prime factorization.

$8 = 2 \times 2 \times 2 = 2^3$

$12 = 2 \times 2 \times 3 = 2^2 \times 3$

The prime factors of 8 and 12 are 2 and 3. Multiply the greatest power of both 2 and 3.

The LCM of 8 and 12 is $2^3 \times 3$, or 24.

Method 2 Divide by prime numbers.

$$\begin{array}{r|l} 2 & 8 \quad 12 \\ 2 & 4 \quad 6 \end{array}$$

← Start here.

Start dividing by prime factors until both numbers cannot be divided by the same divisor. Then multiply the divisors and quotients to get the LCM.

Lesson 5–7

EXERCISES

Find the LCM of each set of numbers.

1. 4, 6

2. 6, 9

3. 5, 9

4. 8, 10

5. 12, 15

6. 15, 21

7. 4, 15

8. 8, 20

9. 8, 16

10. 6, 14

11. 12, 20

12. 9, 12

13. 14, 21

14. 6, 15

15. 4, 6, 8

16. 3, 5, 6

NAME _____ DATE _____ PERIOD _____

5-7

Practice: Skills

Least Common Multiple

Find the LCM of each set of numbers.

1. 2, 8

2. 6, 10

3. 10, 11

4. 10, 12

5. 9, 18

6. 4, 22

7. 12, 30

8. 4, 13

9. 25, 30

10. 250, 30

11. 200, 18

12. 70, 90

13. 18, 54

14. 30, 65

15. 180, 252

16. 20, 55

17. 21, 60

18. 3, 5, 10

19. 3, 4, 13

20. 4, 10, 12

21. 6, 15, 20

22. 48, 16, 3

23. 66, 55, 44

24. 29, 58, 4

NAME _____ DATE _____ PERIOD _____

5-7

Practice: Word Problems

Least Common Multiple

1. PROMOTION In a promotion for a local delicatessen, every eighth customer will get a free sandwich and every sixth customer will get a free drink. Which customer will be first to get both a free sandwich and a free drink?	**2. WORK** Alano and Abey both work at night. Alano has every fourth night off and Abey has every sixth night off. If they are both off tonight, how long will it be before they are both off again?
3. RADIO A radio station is giving away a discount coupon to every twelfth caller and a free concert ticket to every twentieth caller. Which caller will be first to win both the coupon and the ticket?	**4. MUSIC** Faith spent the same amount of money on cassette tapes as she did on CDs. If tapes cost \$12 and CDs cost \$16, what is the least amount of money she could have spent on each?
5. BIKES Three bike riders ride around a circular path. The first rider circles the path in 12 minutes, the second in 18 minutes, and the third in 24 minutes. If they all start at the same place, at the same time, and go in the same direction, after how many minutes will they meet at the starting point?	**6. PAPER GOODS** At a party store, paper cups come in packages of 15, paper plates come in packages of 30, and napkins come in packages of 20. In order to have the same number of cups, plates, and napkins, what is the least number of each that must be purchased?

NAME _____ DATE _____ PERIOD _____

5-7 Reading to Learn Mathematics

Least Common Multiple

Pre-Activity

Complete the Mini Lab at the top of page 224 in your textbook. Write your answers below.

1. Add a second floor to each building. Record the total number of cubes used in a table like the one shown below.

Number of Floors	1	2	3	4	5
Number of Cubes in Building 1	9				
Number of Cubes in Building 2	12				

2. Continue adding floors until each building has five floors. Record your results.

3. Describe two buildings that have the same number of cubes.

4. If you keep adding floors, will the two buildings have the same number of cubes again? Explain.

Reading the Lesson

5. Explain how to use a Venn diagram to find the LCM of two numbers.

6. Look at Example 2, Method 2, at the top of page 225. Which of the numbers are divisors? Which are quotients?

Helping You Remember

7. Explain how to find the LCM of two or more numbers when you know the prime factorization of each number. Give an example.

NAME _____ DATE _____ PERIOD _____

5-7 Enrichment

A Cross-Number Puzzle

Use the clues at the bottom of the page to complete the puzzle. You are to write one digit in each box.

A 2	9	3		B			C		D
5				E					
8		F	G		H		I		
J							K		
		L				M			
N					O			P	
		Q					R		

Across

C largest number less than 200 that is divisible by 29

E square of first prime greater than 20

F least common multiple of 3 and 11

H next term in sequence 61, 122, 244, 488

J greatest common factor of 141 and 329

K the eighth power of 2

L least common multiple of 2, 7, and 13

M numerator of fraction equal to 0.8125

N least common multiple of 86 and 5

O smallest prime greater than 60

P largest two-digit prime

Q next term in sequence 4, 15, 26, 37

R largest two-digit composite less than 40

Down

B smallest number divisible by 3 and 5

D the sixth power of 4

G least common multiple of 2 and 179

H the number of two-digit positive integers

I smallest number over 600 divisible by 89

L smallest three-digit number divisible by 13.

M the smallest two-digit prime number

N largest prime factor of 82

O perfect square between 60 and 70

P largest two-digit number divisible by 3

Lesson 5–7

NAME _____ DATE _____ PERIOD _____

5-8 Study Guide and Intervention

Comparing and Ordering Rational Numbers

To compare fractions, rewrite them so they have the same denominator. The **least common denominator (LCD)** of two fractions is the LCM of their denominators.

Another way to compare fractions is to express them as decimals. Then compare the decimals.

EXAMPLE 1 **Which fraction is greater, $\frac{3}{4}$ or $\frac{4}{5}$?**

Method 1 Rename using the LCD.

$\frac{3}{4} = \frac{3 \times 5}{4 \times 5} = \frac{15}{20}$

$\frac{4}{5} = \frac{4 \times 4}{5 \times 4} = \frac{16}{20}$

The LCD is 20.

Because the denominators are the same, compare numerators.

Since $\frac{16}{20} > \frac{15}{20}$, then $\frac{4}{5} > \frac{3}{4}$.

Method 2 Write each fraction as a decimal. Then compare decimals.

$\frac{3}{4} = 0.75$

$\frac{4}{5} = 0.8$

Since $0.8 > 0.75$, then $\frac{4}{5} > \frac{3}{4}$.

EXERCISES

Find the LCD of each pair of fractions.

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

2. $\frac{1}{3}, \frac{3}{4}$

3. $\frac{3}{4}, \frac{7}{10}$

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

4. $\frac{1}{2}$ ● $\frac{4}{9}$

5. $\frac{4}{5}$ ● $\frac{8}{10}$

6. $\frac{3}{4}$ ● $\frac{7}{8}$

7. $\frac{1}{2}$ ● $\frac{5}{9}$

8. $\frac{9}{14}$ ● $\frac{10}{17}$

9. $\frac{5}{7}$ ● $\frac{6}{11}$

10. $\frac{8}{17}$ ● $\frac{1}{2}$

11. $\frac{9}{10}$ ● $\frac{17}{19}$

NAME _____ DATE _____ PERIOD _____

5-8 Practice: Skills

Comparing and Ordering Rational Numbers

Find the LCD of each pair of fractions.

1. $\frac{4}{7}, \frac{3}{5}$

2. $\frac{5}{12}, \frac{7}{24}$

3. $\frac{6}{28}, \frac{3}{7}$

4. $\frac{7}{15}, \frac{1}{4}$

5. $\frac{7}{11}, \frac{3}{5}$

6. $\frac{5}{17}, \frac{7}{8}$

7. $\frac{5}{12}, \frac{7}{10}$

8. $\frac{15}{16}, \frac{1}{4}$

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

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

10. $\frac{3}{10} \bullet \frac{2}{9}$

11. $\frac{3}{7} \bullet \frac{5}{11}$

12. $\frac{9}{12} \bullet \frac{3}{4}$

13. $\frac{12}{13} \bullet \frac{14}{15}$

14. $\frac{4}{5} \bullet \frac{5}{4}$

15. $\frac{17}{30} \bullet \frac{13}{20}$

16. $\frac{35}{60} \bullet \frac{49}{84}$

17. $3\frac{4}{11} \bullet 3\frac{7}{20}$

18. $1\frac{2}{3} \bullet \frac{9}{7}$

Order each set of ratios from least to greatest.

19. $0.48, 0.46, \frac{9}{20}$

20. $0.99, 0.89, \frac{7}{8}$

21. $\frac{1}{4}, 0.2, 0.4$

Determine whether each number is rational. Write *yes* or *no*.

22. 2.323323332...

23. $\frac{7}{19}$

24. $4.\overline{3}$

Lesson 5–8

NAME _____ DATE _____ PERIOD _____

5-8 Practice: Word Problems

Comparing and Ordering Rational Numbers

1. RAIN The amount of rainfall was measured after a recent storm. The north side of town received $\frac{7}{8}$ inch of rain, and the south side received $\frac{13}{15}$ inch of rain. Which side of town received more rain from the storm?	**2. MOVIES** Because he sees movies at his local theater so often, Delmar is being offered a discount. He can have either $\frac{1}{3}$ off his next ticket or 30% off his next ticket. Which discount should Delmar choose? Explain.
3. TRACK Willie runs the 110-meter hurdles in $17\frac{3}{5}$ seconds, and Anier runs it in $17\frac{6}{11}$ seconds. Which runner is faster?	**4. FARMING** Cassie successfully harvested $\frac{7}{12}$ of her crop, and Robert successfully harvested 58% of his crop. Which person successfully harvested the larger portion of his or her crop?
5. TRANSPORTATION My-Lien has enough room in her truck to move 3.385 tons of gravel. Her father has asked her to move $3\frac{5}{16}$ tons. Will My-Lien be able to move all of the gravel in only one trip? Explain.	**6. WOOD WORKING** Kishi has a bolt that is $\frac{5}{8}$ inch wide, and she drilled a hole 0.6 inch wide. Is the hole large enough to fit the bolt? Explain.
7. PIZZA In a recent pizza-eating contest, Alfonso ate $1\frac{3}{8}$ pizzas, Della ate $1\frac{3}{10}$ pizzas, and Delsin ate $1\frac{4}{9}$ pizzas. Which person won the contest?	**8. STUDYING** For a recent algebra exam, Pat studied $1\frac{8}{15}$ hours, Toni studied $1\frac{11}{20}$ hours, and Morgan studied $1\frac{9}{16}$ hours. List the students in order by who studied the most.

NAME _____ DATE _____ PERIOD _____

5-8 Reading to Learn Mathematics

Comparing and Ordering Rational Numbers

Pre-Activity

Read the introduction at the top of page 227 in your textbook. Write your answers below.

1. A batting average is the ratio of hits to at-bats. Write each player's batting average as a fraction.

2. Estimate which fraction is greater than $\frac{1}{2}$. Which is less than $\frac{1}{2}$?

3. Which player has the better batting average?

Reading the Lesson

4. What are three ways in which you can compare fractions?

5. Complete the following table of common fraction-decimal-percent equivalents.

Fraction	Decimal	Percent
$\frac{1}{5}$		20%
	0.6	
$\frac{7}{10}$		
		25%

6. How are the following sets of numbers related: whole numbers, rational numbers, integers?

Helping You Remember

7. In this lesson you learned about the LCD. What do each of the following abbreviations stand for: LCD, LCM, and GCF? How are the LCD and LCM related?

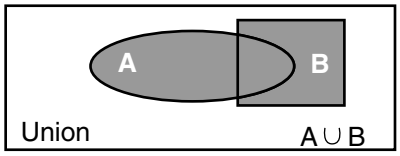
Lesson 5–8

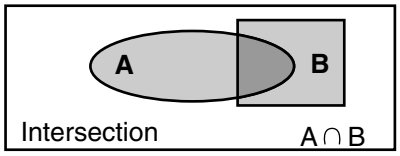
NAME _____ DATE _____ PERIOD _____

5-8 Enrichment

Intersection and Union of Sets

The darker shaded areas in the Venn diagrams show the *union* and *intersection* of sets A and B.





For example, if $A = \{1, 2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$, then their union and intersection are written as:

Union: $A \cup B = \{1, 2, 3, 4, 5, 6\}$ Intersection: $A \cap B = \{3, 4\}$

Draw a Venn diagram for sets A and B. Then write the numbers included in $A \cup B$ and $A \cap B$. In Exercises 2 and 4, record the numbers as decimals.

1. A = {integers between 0 and 7}
B = {factors of 12}

2. A = {one-place decimals between 0 and 0.5}
B = {fractions with 1, 2, 3, or 4 as numerator and 5 as a denominator}

3. A = {perfect squares between 0 and 30}
B = {odd whole numbers less than 10}

4. $A = \left\{\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}\right\}$
$B = \{0.\overline{1}, 0.\overline{2}, 0.\overline{3}, 0.\overline{4}, 0.\overline{5}, 0.\overline{6}, 0.\overline{7}, 0.\overline{8}, 0.\overline{9}\}$