Name ______________________________

Reteaching

5-2

Prime Factorization

A prime number has exactly two factors, 1 and itself.

Example: 17 is prime. Its factors are 1 and 17.

A composite number has more than two factors.

Example: 10 is composite. Its factors are 1, 2, 5, and 10.

One way to find the prime factors of a composite number is to divide by prime numbers.

$84 \div \mathbf{2} = 42$	84 is even. Divide by 2.
$42 \div \mathbf{2} = 21$	Divide by 2 until the quotient is odd.
$21 \div \mathbf{3} = 7$	3 is a prime factor of 21, divide by 3.
$7 \div \mathbf{7} = 1$	7 is prime. You have found the prime factors.

Write the prime factors from least to greatest: $84 = 2 \times 2 \times 3 \times 7$.

Then write the factors in exponential form: $2^2 \times 3 \times 7$.

For **1** through **12,** if a number is prime, write *prime.* If the number is composite, write the prime factorization.

1. 28 $2^2 \times 7$

2. 36 $2^2 \times 3^2$

3. 29 Prime

4. 70 $2 \times 5 \times 7$

5. 55 5×11

6. 81 3^4

7. 84 $2^2 \times 3 \times 7$

8. 99 $3^2 \times 11$

9. 75 $5^2 \times 3$

10. 43 Prime

11. 45 $3^2 \times 5$

12. 64 2^6

13. Writing to Explain Explain how you can check to see if your prime factorization is correct.

Sample answer: Multiply the prime numbers to see if you get the original number.

14. Strategy Practice How can you tell that 342 is divisible by 3?

Sample answer: The sum of the digits is divisible by 3.

Name ______________________________

Prime Factorization

For **1** through **10** if the number is prime, write *prime.* If the number is composite, write the prime factorization.

1. 24 $2^3 \times 3$

2. 43 Prime

3. 51 3×17

4. 66 $2 \times 3 \times 11$

5. 61 Prime

6. 96 $2^5 \times 3$

7. 144 $2^4 \times 3^2$

8. 243 3^5

9. 270 $2 \times 3^3 \times 5$

10. 124 $2^2 \times 31$

11. Writing to Explain Find the first ten prime numbers. Tell how you do it.

2, 3, 5, 7, 11, 13, 17, 19, 23, 29; Sample answer: Use divisibility rules to check that no lesser number can be divided into the number you are testing.

12. Reasoning How many even prime numbers are there?

A 0

[✓ **B**] 1

C 2

D 3

13. Critical Thinking Which answer completes the sentence below?

The number 1 is ______________________.

A prime.

B composite.

[✓ **C**] neither prime nor composite.

D both prime and composite.

Name ____________________

Greatest Common Factor

The greatest number that divides into two numbers is the greatest common factor (GCF) of the two numbers. Here are two ways to find the GCF of 12 and 40.

List the Factors

Step 1: List the factors of each number.

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

40: 1, 2, 4, 5, 8, 10, 20, 40

Step 2: Circle the factors that are common to both numbers.

12: 1, ②, 3, ④, 6, 12

40: 1, ②, ④, 5, 8, 10, 20, 40

Step 3: Choose the greatest factor that is common to both numbers. Both 2 and 4 are common factors, but 4 is greater.

The GCF is 4.

Use Prime Factorization

Step 1: Write the prime factorization of each number.

12: 2 × 2 × 3

40: 2 × 2 × 2 × 5

Step 2: Circle the prime factors that the numbers have in common.

12: ② × ② × 3

40: ② × ② × 2 × 5

Step 3: Multiply the common factors.

2 × 2 = 4 The GCF is 4.

Find the GCF for each set of numbers.

1. 10, 70 10

2. 4, 20 4

3. 18, 24 6

4. 18, 63 9

5. 36, 42 6

6. 14, 28 14

7. **Number Sense** Name two numbers that have a greatest common factor of 8.

Sample answer: 16 and 24

8. **Geometry** Al's garden is 18 feet long and 30 feet wide. He wants to put fence posts the same distance apart along both the length and width of the fence. What is the greatest distance apart he can put the fence posts?

6 feet

Name ____________________

Greatest Common Factor

Find the GCF for each set of numbers.

1. 12, 48 12

2. 20, 24 4

3. 21, 84 21

4. 24, 100 4

5. 18, 130 2

6. 200, 205 5

7. **Number Sense** Name three pairs of numbers that have 5 as their greatest common factor. Use each number only once in your answer.

Sample answer: 5, 10; 25, 30; 50, 55

8. The bake-sale committee divided each type of item evenly onto plates, so that every plate contained only one type of item and every plate had exactly the same number of items with no leftovers. What is the maximum number of items that could have been placed on each plate?

Bake Sale Donations	
Muffins	96
Bread sticks	48
Rolls	84

12

9. Using this system, how many plates of rolls could the bake-sale committee make? 7

10. Using this system, how many plates of muffins could the bake-sale committee make? 8

11. Which of the following pairs of numbers is correctly listed with its greatest common factor?

[✓ **A**] 20, 24; GCF: 4

B 50, 100; GCF: 25

C 4, 6; GCF: 24

D 15, 20; GCF: 10

12. **Writing to Explain** Explain one method of finding the greatest common factor of 48 and 84.

Sample answer: You can use prime factorization to find the GCF of 48 and 84 by multiplying their common prime factors: 2 × 2 × 3 = 12.

Name ____________________

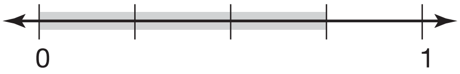
Understanding Fractions

Fractions are used to show part of a set.

The fraction of the shapes that are stars can be written as:

$$\frac{\text{Number of stars}}{\text{Total number of shapes}} = \frac{3}{7}$$

Fractions are used to show part of 1 whole.

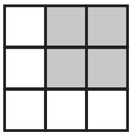


The length between 0 and 1 is divided into 4 equal sections. The fraction for the shaded section can be written as:

$$\frac{\text{Number of shaded sections}}{\text{Total number of sections}} = \frac{3}{4}$$

Write the fraction that represents the shaded portion.

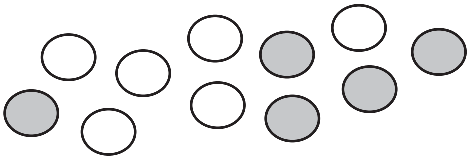
1.



$$\frac{\text{Number of shaded parts}}{\text{Total number of parts}} = \frac{4}{☐}$$

9; $\frac{4}{9}$

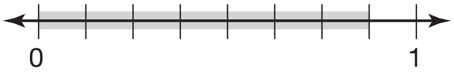
2.



$$\frac{\text{Number of shaded circles}}{\text{Total number of circles}} = \frac{☐}{☐}$$

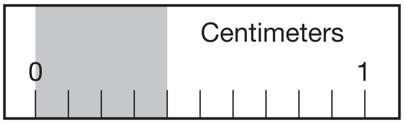
$\frac{5}{11}$

3.



$\frac{7}{8}$

4 .

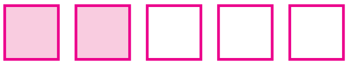


$\frac{4}{10}$

Draw models of fractions.

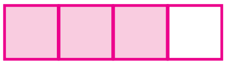
5. Draw a set and shade $\frac{2}{5}$.

Sample answer



6. Draw a whole and shade $\frac{3}{4}$.

Sample answer



7. **Number Sense** If you shade $\frac{1}{3}$ of a set, what fraction of the set is not shaded?

$\frac{2}{3}$

Name ________________________________

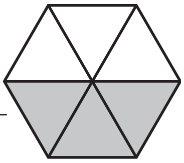
Practice

5-4

Understanding Fractions

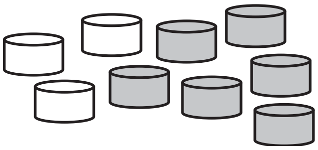
Write the fraction that represents the shaded portion.

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

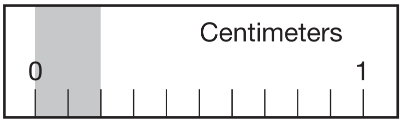


2. $\frac{1}{4}$

3. $\frac{6}{9}$



4. $\frac{2}{10}$



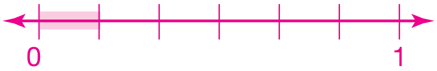
Draw models of fractions.

5. Draw a set to represent $\frac{4}{10}$.

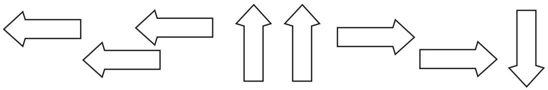
Sample answer

6. Draw a number line to represent $\frac{1}{6}$.

Sample answer



7. **Write a Problem** Write a fraction problem that can be solved using this model.



Sample answer; What fraction of the arrows are pointing up? ; $\frac{2}{8}$ or $\frac{1}{4}$

8. **Writing to Explain** Sharon drew this drawing to show $\frac{3}{5}$. Is her drawing correct? Explain why or why not.

It is not correct because all of the sections are not the same size.

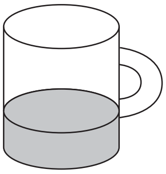
9. **Estimation** Which is the best estimate of how full the cup is?

A $\frac{3}{4}$ full

B $\frac{1}{2}$ full

[✓ **C**] $\frac{1}{3}$ full

D $\frac{1}{8}$ full



Name ______________________________

Equivalent Fractions

Use multiplication to find an equivalent fraction:

$\frac{3}{7} \times \frac{4}{4} = \frac{12}{28}$

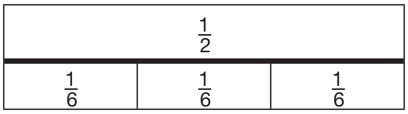
$\frac{3}{7} = \frac{12}{28}$

Use division to find an equivalent fraction.

$\frac{10}{12} \div \frac{2}{2} = \frac{10 \div 2}{12 \div 2} = \frac{5}{6}$

$\frac{10}{12} = \frac{5}{6}$

Equivalent fractions name the same amount.



$\frac{1}{2} = \frac{3}{6}$

Remember, you can multiply or divide fractions by 1:

$\frac{4}{4} = 1 \qquad \frac{2}{2} = 1$

Use multiplication to find an equivalent fraction. `

Sample answers are given.

1. $\frac{3}{8}$ $\frac{6}{16}$

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

3. $\frac{4}{7}$ $\frac{8}{14}$

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

5. $\frac{5}{9}$ $\frac{10}{18}$

6. $\frac{3}{10}$ $\frac{6}{20}$

7. $\frac{8}{11}$ $\frac{16}{22}$

8. $\frac{7}{16}$ $\frac{14}{32}$

9. $\frac{11}{12}$ $\frac{22}{24}$

Use division to find an equivalent fraction. Sample answers are given

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

11. $\frac{4}{18}$ $\frac{2}{9}$

12. $\frac{15}{60}$ $\frac{1}{4}$

13. $\frac{16}{20}$ $\frac{4}{5}$

14. $\frac{80}{100}$ $\frac{20}{25}$

15. $\frac{35}{45}$ $\frac{7}{9}$

16. $\frac{25}{75}$ $\frac{1}{3}$

17. $\frac{32}{48}$ $\frac{4}{6}$

18. $\frac{18}{32}$ $\frac{9}{16}$

Find two equivalent fractions for each given fraction.

Sample answers are given.

19. $\frac{2}{4}$ $\frac{1}{2}, \frac{4}{8}$

20. $\frac{3}{9}$ $\frac{1}{3}, \frac{9}{27}$

21. $\frac{10}{12}$ $\frac{5}{6}, \frac{30}{36}$

22. $\frac{75}{100}$ $\frac{3}{4}, \frac{300}{400}$

23. $\frac{1}{2}$ $\frac{7}{14}, \frac{8}{16}$

24. $\frac{7}{12}$ $\frac{14}{24}, \frac{21}{36}$

25. $\frac{36}{48}$ $\frac{3}{4}, \frac{9}{12}$

26. $\frac{5}{6}$ $\frac{10}{12}, \frac{15}{18}$

27. $\frac{1}{8}$ $\frac{3}{24}, \frac{5}{40}$

28. **Number Sense** Why do you have to multiply or divide both the numerator and denominator of a fraction to find an equivalent fraction?

Because you can only find an equivalent fraction if you multiply or divide by 1. You have to make sure the numerator and denominator increase or decrease by the same ratio, so you multiply or divide by names for 1 such as $\frac{2}{2}$ or $\frac{6}{6}$.

Name ______________________________

Equivalent Fractions

Sample answers are given. Others are possible.

Find two fractions equivalent to each fraction.

1. $\frac{5}{6}$ $\frac{10}{12}$, $\frac{15}{18}$

2. $\frac{15}{30}$ $\frac{3}{6}$, $\frac{1}{2}$

3. $\frac{45}{60}$ $\frac{3}{4}$, $\frac{90}{120}$

4. $\frac{7}{8}$ $\frac{14}{16}$, $\frac{21}{24}$

5. $\frac{20}{8}$ $\frac{10}{4}$, $\frac{100}{40}$

6. $\frac{16}{32}$ $\frac{1}{2}$, $\frac{32}{64}$

7. $\frac{36}{60}$ $\frac{3}{5}$, $\frac{12}{20}$

8. $\frac{32}{96}$ $\frac{8}{24}$, $\frac{4}{12}$

9. $\frac{2}{3}$ $\frac{4}{6}$, $\frac{6}{9}$

10. **Number Sense** Are the fractions $\frac{1}{5}$, $\frac{5}{5}$, and $\frac{5}{1}$ equivalent? Explain.

No. $\frac{5}{5} = 1$ and $\frac{5}{1} = 5$. Neither is equivalent to $\frac{1}{5}$.

11. The United States currently has 50 states. What fraction of the states had become a part of the United States by 1795? Write your answer as two equivalent fractions.

$\frac{3}{10}$, $\frac{30}{100}$

Number of States in the United States

Year	Number of States
1795	15
1848	30
1900	45
1915	48
1960	50

12. In what year was the total number of states in the United States $\frac{3}{5}$ the number it was in 1960?

1848

13. The United States currently has 50 states. Write two fractions that describe the number of states that had become part of the United States in 1915?

$\frac{24}{25}$, $\frac{96}{100}$

14. Which of the following pairs of fractions are equivalent?

A $\frac{1}{10}$, $\frac{3}{33}$

B $\frac{9}{5}$, $\frac{5}{9}$

[✓ **C**] $\frac{5}{45}$, $\frac{1}{9}$

D $\frac{6}{8}$, $\frac{34}{48}$

15. **Writing to Explain** In what situation can you use only multiplication to find equivalent fractions to a given fraction? Give an example.

If the fraction has a 1 in the numerator, you can use only multiplication: $\frac{1}{3} \times \frac{3}{3} = \frac{3}{9}$

Name ____________________

Fractions in Simplest Form

Remember: A fraction is in simplest form if the numerator and denominator have no common factors except 1.

Divide the numerator and denominator by the same number. Divide until you cannot divide evenly.	$\frac{42}{48} \div \frac{2}{2} = \frac{42 \div 2}{48 \div 2} = \frac{21}{24}$ $\frac{21}{24} \div \frac{3}{3} = \frac{21 \div 3}{24 \div 3} = \frac{7}{8}$
Find the GCF (greatest common factor). Divide both the numerator and denominator by the GCF.	Factors of 42: 1, 2, 3, 6, 7, 14, 21, 42 Factors of 48: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48 The GCF is 6. $\frac{42}{48} \div \frac{6}{6} = \frac{42 \div 6}{48 \div 6} = \frac{7}{8}$

Use division to write each fraction in simplest form.

1. $\frac{8}{10}$ $\frac{4}{5}$

2. $\frac{14}{20}$ $\frac{7}{10}$

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

4. $\frac{20}{35}$ $\frac{4}{7}$

5. $\frac{16}{24}$ $\frac{2}{3}$

6. $\frac{12}{18}$ $\frac{2}{3}$

7. $\frac{36}{96}$ $\frac{3}{8}$

8. $\frac{45}{60}$ $\frac{3}{4}$

9. $\frac{91}{156}$ $\frac{7}{12}$

10. $\frac{6}{20}$ $\frac{3}{10}$

11. $\frac{21}{105}$ $\frac{1}{5}$

12. $\frac{75}{90}$ $\frac{5}{6}$

Find the GCF of the numerator and denominator.

13. $\frac{6}{16}$ 2

14. $\frac{35}{50}$ 5

15. $\frac{24}{40}$ 8

16. $\frac{28}{32}$ 4

17. $\frac{18}{24}$ 6

18. $\frac{33}{36}$ 3

Use the GCF to write each fraction in simplest form.

19. $\frac{32}{48}$ $\frac{2}{3}$

20. $\frac{21}{56}$ $\frac{3}{8}$

21. $\frac{9}{54}$ $\frac{1}{6}$

22. $\frac{30}{54}$ $\frac{5}{9}$

23. $\frac{21}{36}$ $\frac{7}{12}$

24. $\frac{18}{42}$ $\frac{3}{7}$

25. **Reasoning** Under what circumstances would the GCF be equal to the numerator of a fraction before simplifying?

If the simplified fraction has a 1 in the numerator, then the GCF is the same as the numerator of the unsimplified fraction.

Name ____________________

Fractions in Simplest Form

Write each fraction in simplest form.

1. $\frac{8}{16}$ $\frac{1}{2}$
2. $\frac{15}{20}$ $\frac{3}{4}$
3. $\frac{10}{12}$ $\frac{5}{6}$
4. $\frac{20}{35}$ $\frac{4}{7}$
5. $\frac{16}{48}$ $\frac{1}{3}$
6. $\frac{45}{100}$ $\frac{9}{20}$
7. $\frac{60}{96}$ $\frac{5}{8}$
8. $\frac{72}{75}$ $\frac{24}{25}$
9. $\frac{32}{36}$ $\frac{8}{9}$
10. $\frac{8}{28}$ $\frac{2}{7}$
11. $\frac{21}{56}$ $\frac{3}{8}$
12. $\frac{63}{81}$ $\frac{7}{9}$

13. **Number Sense** How can you check to see if a fraction is written in simplest form?

Check to see if the numerator and denominator have any common factors other than 1. If they don’t, the fraction is in simplest form.

14. **Writing to Explain** What is the GCF and how is it used to find the simplest form of a fraction?

The GCF is the greatest common factor of the numerator and denominator. If you divide the numerator and denominator by the GCF, you get the simplest form of the fraction.

Find the GCF of the numerator and denominator of the fraction.

15. $\frac{8}{26}$ 2
16. $\frac{30}{75}$ 15
17. $\frac{48}{72}$ 24

Use the GCF to write each fraction in simplest form.

18. $\frac{12}{16}$ $\frac{3}{4}$
19. $\frac{12}{20}$ $\frac{3}{5}$
20. $\frac{30}{36}$ $\frac{5}{6}$
21. $\frac{35}{56}$ $\frac{5}{8}$
22. $\frac{28}{63}$ $\frac{4}{9}$
23. $\frac{42}{72}$ $\frac{7}{12}$

24. What is the simplest form of the fraction $\frac{81}{108}$?

A $\frac{28}{36}$
[✓ B] $\frac{3}{4}$
C $\frac{2}{3}$
D $\frac{4}{5}$

Name ____________________

Reteaching

5-7

Problem Solving: Make and Test Conjectures

A **conjecture** is a generalization that you think is true.

Remember

Make a conjecture.	The sum of two prime numbers is never a prime number.
Find and test several examples. 3 + 5 = 8	Prime numbers: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29 5 + 7 = 12 2 + 3 = 5
Do the examples show your conjecture is reasonable or not reasonable?	The sum may be prime. The conjecture is not reasonable.

Test these conjectures. Give three examples. Explain whether the conjectures are *reasonable* or *not reasonable*.

1. All multiples of 5 are even numbers.

   5 × 3 = 15; 5 × 7 = 35; 5 × 11 = 55; not reasonable.

2. All odd numbers are prime numbers.

   9 is odd but not prime; 15 is odd but not prime; 21 is odd but not prime; not reasonable.

3. The difference of two even numbers is always an even number.

   24 – 4 = 20; 42 – 16 = 26; 8 – 2 = 6; reasonable

4. Write a conjecture about the sum of two negative integers. Then test your conjecture.

   Sample answer: The sum of two negative integers is always negative.
   –2 + (–6) = –8; –3 + (–7) = –10; –12 + (–4) = –16; reasonable

5. **Critical Thinking** After testing, why is a conjecture considered reasonable, but not proven?

   It is impossible to test every set of numbers. Because it only takes one example to show the conjecture is not reasonable, you can't say that it has been proven.

Name ______________________________

Practice

5-7

Problem Solving: Make and Test Conjectures

Test these conjectures. Give three examples. Explain if the conjecture is *reasonable* or *not reasonable*.

1. If a number is divisible by 4, it is always an even number.

20 ÷ 4 = 5; 40 ÷ 4 = 10; 24 ÷ 4 = 6; reasonable

2. The product of two whole numbers is always greater than 1.

1 × 2 = 2; 1 × 1 = 1; 1 × 0 = 0; not reasonable

3. If a number has a 9 in the ones place, it is always divisible by 3.

9 ÷ 3 = 3; 19 ÷ 3 = 6.333; 29 ÷ 3 = 9.666; not reasonable

4. The least common denominator of two fractions is always greater than the denominators of the fractions.

$\frac{1}{2}$ and $\frac{2}{4}$: 4; $\frac{2}{3}$ and $\frac{1}{2}$: 6; $\frac{3}{5}$ and $\frac{2}{3}$: 15; not reasonable

5. Write a conjecture about the product of two odd numbers. Then test your conjecture.

Sample answer: The product of two odd numbers is always odd. 3 × 5 = 15; 7 × 3 = 21; 13 × 7 = 91; reasonable

6. Write a conjecture about the sum of two fractions. Then test your conjecture.

Sample answer: the sum of two fractions is always less than 1. $\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$; $\frac{1}{2} + \frac{1}{2} = 1$; $\frac{1}{2} + \frac{3}{4} = 1\frac{1}{4}$; not reasonable

7. **Reasoning** How is testing a conjecture like finding a statement true or false? How is it different?

Sample answer: It is alike because you can say that the conjecture is false if you find an example that doesn't work. It is different because you can't say that the conjecture is true since you may not have found one of the false examples.

Practice **5-7**