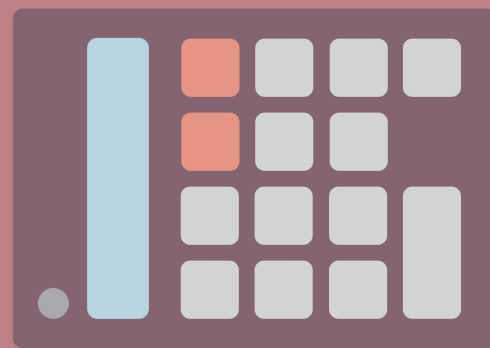




# MATH

Student Book



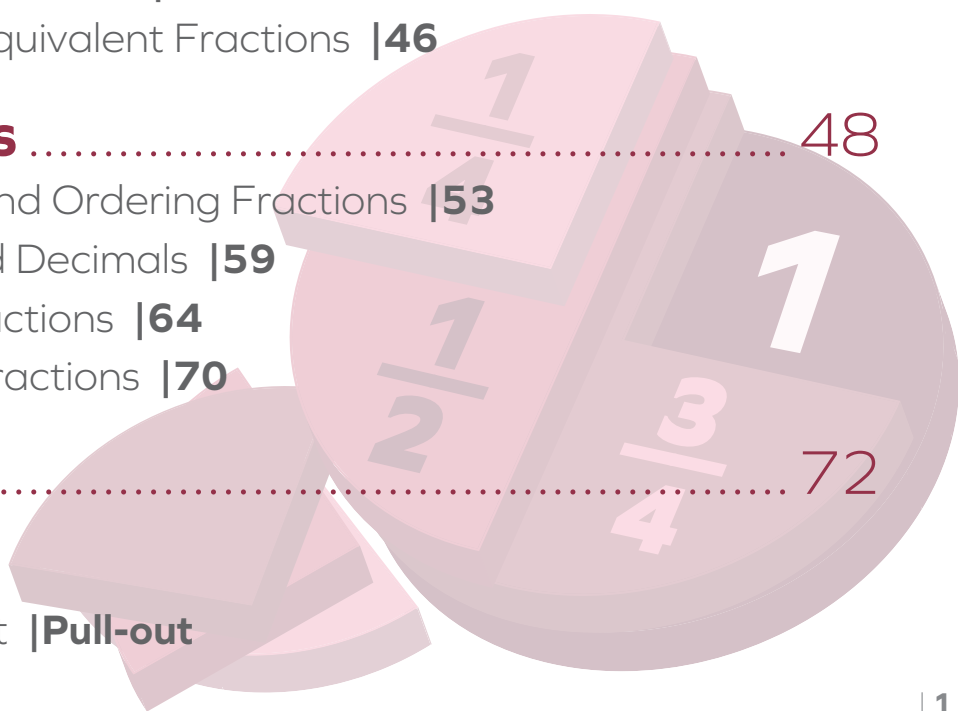
► **5th Grade | Unit 6**

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# MATH 506

## FACTORS AND FRACTIONS

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# FACTORS AND FRACTIONS

In this unit, you will begin exploring fractions. You will use models, number lines, proper fractions, improper fractions, and mixed numbers to represent part of a whole. You will learn how to find all the factors of a number and its prime factorization. Then, you will use the greatest common factor to write a fraction in simplest form. You will also learn how to find multiples of a number and then use the least common multiple to write equivalent fractions and compare fractions. In addition, you will study converting between decimal numbers and fractions, as well as rounding fractions to the nearest whole number.

## Objectives

**Read these objectives.** The objectives tell you what you will be able to do when you have successfully completed this LIFEPAAC. When you have finished this LIFEPAAC, you should be able to:

- Prime factor composite numbers.
- Find the GCF and the LCM.
- Simplify fractions.
- Review fractions, improper fractions, and mixed numbers.
- Write equivalent fractions, and order and compare fractions using the LCD.
- Convert between fractions and decimals.
- Round fractions and mixed numbers.

# 1. FACTORS

Do you know what the word *divisible* means? For example, what does it mean for a number to be divisible by 2? How about 3? It means that the number can be divided by 2 or 3 evenly, without a remainder. In this lesson, we'll learn about divisibility, and learn some rules for finding out which numbers are divisible by certain numbers.

## Objectives

Read these objectives. When you have completed this section, you should be able to:

- Find all the factors of a number.
- Determine if a number is prime or composite.
- Find the prime factorization of a number.
- Find the GCF of two numbers.

## Vocabulary

Study these new words. Learning the meanings of these words is a good study habit and will improve your understanding of this LIFEPAC.

**composite number.** A number that has more factors than just 1 and itself.

**divisible.** Able to be divided evenly, without a remainder.

**factor.** A number that divides evenly into another number.

**factor tree.** An organized way of finding the prime factorization of a number.

**greatest common factor.** The largest factor that any given numbers have in common.

**prime factorization.** The product of prime factors of a number.

**prime number.** A number whose only factors are 1 and itself.

**Note:** All vocabulary words in this LIFEPAC appear in **boldface** print the first time they are used. If you are unsure of the meaning when you are reading, study the definitions given.

## Factors

Figuring out if small numbers are divisible by 2 or 3 is pretty easy because the numbers are small and easy to divide. Finding the factors of larger numbers can be more difficult. We can use the divisibility rules to help us figure out what a number is divisible by. The rule for 2 is *if the number is even, then it's divisible by 2*. And the rule for 3 is *if the sum of the digits is divisible by 3, then the number is divisible by 3*. Here is a table showing the rules and examples for 2, 3, 4, 5, 6, 9, and 10:

	<b>RULE</b>	<b>EXAMPLE</b>	
<b>2</b>	The number is even.	86	86 is even, so it's divisible by 2.
<b>3</b>	The sum of the digits is divisible by 3.	48	$4 + 8 = 12$ 12 is divisible by 3, so 48 is divisible by 3.
<b>4</b>	The last two digits are divisible by 4.	136	36 is divisible by 4, so 136 is divisible by 4.
<b>5</b>	The ones digit is 0 or 5.	75	75 has a 5 in the ones place, so it's divisible by 5.
<b>6</b>	The number is divisible by both 2 and 3.	48	48 is even, so it's divisible by 2. From above, 48 is divisible by 3. 48 is divisible by both 2 and 3, so it's divisible by 6.
<b>9</b>	The sum of the digits is divisible by 9.	108	$1 + 0 + 8 = 9$ 9 is divisible by 9, so 108 is divisible by 9.
<b>10</b>	The ones digit is 0.	140	140 has a 0 in the ones place, so it's divisible by 10.

### Example:

Use the table of divisibility rules to find what numbers 60 is divisible by.

### Solution:

- 60 ends in 0, so it is even and divisible by 2, 5, and 10.
- $6 + 0 = 6$ , which is divisible by 3, but not 9. So, 60 is divisible by 3.
- Since 60 is divisible by 2 and 3, it is also divisible by 6.
- And,  $4 \times 15 = 60$ , so 60 is divisible by 4.

60 is divisible by 2, 3, 4, 5, 6, and 10.

### Did you know?

Since 60 is already a two-digit number, the divisibility rule for 4's doesn't really help. For two-digit numbers, you'll just have to try dividing by 4 to see if the number is divisible by 4.

In the previous example, we found that 60 was divisible by 2, 3, 4, 5, 6, and 10. Each of these numbers is a **factor** of 60. Using these factors, we can actually find *all* the factors of 60. That means we can find every number that goes into 60 evenly. For example, we know that 60 is divisible by 2. So, it must be divisible by 30, too, because  $2 \times 30 = 60$ . Let's make a list of all the pairs of numbers that multiply to get 60. We'll use the factors we already found to make our list.

$$2 \times 30 = 60$$

$$3 \times 20 = 60$$

$$4 \times 15 = 60$$

$$5 \times 12 = 60$$

$$6 \times 10 = 60$$

$$10 \times 6 = 60$$

There is one more pair of factors to add to our list. Every number is divisible by 1 and itself. So, the final pair to add to our list is  $1 \times 60 = 60$ . All the factors of 60 are 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, and 60. This list represents every number that goes into 60 evenly. Notice that the factors were written in order from smallest to largest and repeated factors were only listed once.

### Vocabulary

A factor is a number that divides evenly into another number.

### Key point...

Every number is divisible by 1 and itself. So, 1 and itself are always factors of a number.

### Example:

Find all the factors of 49.

### Solution:

Let's first check our divisibility rules. 49 is not even and doesn't end in 0 or 5. So, it's not divisible by 2, 5, or 10. The sum of the digits is  $4 + 9 = 13$ . Since 13 is not divisible by 3 or 9, 49 isn't divisible by 3 or 9. 49 isn't divisible by 2 and 3, so it's not divisible by 6, either. And, finally, 49 isn't divisible by 4.

So, none of the numbers from our divisibility rules are factors of 49. Now, let's look for other numbers that divide into 49 evenly. We know that 1 and 49 have to be factors of 49 because  $1 \times 49 = 49$ . And,  $7 \times 7 = 49$ , so 7 is a factor of 49.

The factors of 49 are 1, 7, and 49.

### Be careful...

Although the divisibility rules are a good place to start, make sure you check other numbers too (like 7 and 8) to find *all* the factors of a number.

## Determining if a Number is Prime or Composite

Let's look at these examples:

**Example:**

Find all the factors of 29.

**Solution:**

Again, let's first check our divisibility rules. 29 is not even and doesn't end in 0 or 5. So, it's not divisible by 2, 5, or 10. The sum of the digits is  $2 + 9 = 11$ . Since 11 is not divisible by 3 or 9, 29 isn't divisible by 3 or 9. 29 isn't divisible by 2 and 3, so it's not divisible by 6, either. And, finally 29 isn't divisible by 4 because it cannot be divided by 4 evenly.

And, again, none of the numbers from our divisibility rules are factors of 29. From our multiplication facts, we know that 29 isn't divisible by 7 or 8 either. It appears that the only factors of 29 are 1 and itself.

The factors of 29 are 1 and 29.

In the example, we found that the only factors of 29 are 1 and 29. When a number has only two factors (1 and itself), it's called a **prime number**. Some more examples of prime numbers are 2, 3, 5, 7, 11, and 13. Numbers that have more than two factors are called composite numbers. The other numbers we looked at (60 and 49) are examples of composite numbers.

**Think about it!**

Is 1 prime or composite? The number 1 has only one factor—itsself. Because it doesn't have two or more factors, 1 is the only number that isn't prime or composite.

**Example:**

Is 35 prime or composite?

**Solution:**

Let's see how many factors 35 has. Using the divisibility rules, 35 is divisible by 5 because it ends in 5.

$$1 \times 35 = 35$$

$$5 \times 7 = 35$$

The factors of 35 are 1, 5, 7, and 35. This number has more than two factors, so it is composite.



## Let's Review!

Before going on to the practice problems, make sure you understand the main points of this lesson.

- ✓ The divisibility rules can be used to find factors of a number.
- ✓ Every number is divisible by 1 and itself.
- ✓ A number that has only two factors (1 and itself) is prime. A number that has more than two factors is composite.
- ✓ 1 is the only number that is neither prime nor composite.



### Complete this activity.

**1.1** Place each number in its correct column based on its divisibility.

	Divisible by 2	Divisible by 3	Divisible by 2 and 3
a. 21	_____	_____	_____
b. 16	_____	_____	_____
c. 18	_____	_____	_____
d. 2	_____	_____	_____
e. 15	_____	_____	_____
f. 27	_____	_____	_____
g. 6	_____	_____	_____
h. 8	_____	_____	_____
i. 14	_____	_____	_____
j. 9	_____	_____	_____
k. 12	_____	_____	_____
l. 24	_____	_____	_____

**1.2** Match the terms with their definitions.

- |                           |  |
|---------------------------|--|
| a. _____ composite number | 1. able to be divided evenly, without a remainder        |
| b. _____ divisible        | 2. a number that has more factors than just 1 and itself |
| c. _____ factor           | 3. a number whose only factors are 1 and itself          |
| d. _____ prime number     | 4. a number that divides evenly into another number      |



**Circle the correct letter and answer.**

**1.3** Choose all the numbers that 84 is divisible by. (There may be more than one correct answer.)

- |      |      |       |      |
|------|------|-------|------|
| a. 2 | b. 3 | c. 4  | d. 5 |
| e. 6 | f. 9 | g. 10 |      |

**1.4** Choose all the numbers that 116 is divisible by. (There may be more than one correct answer.)

- |      |      |       |      |
|------|------|-------|------|
| a. 2 | b. 3 | c. 4  | d. 5 |
| e. 6 | f. 9 | g. 10 |      |

**1.5** Choose all the numbers that 135 is divisible by. (There may be more than one correct answer.)

- |      |      |       |      |
|------|------|-------|------|
| a. 2 | b. 3 | c. 4  | d. 5 |
| e. 6 | f. 9 | g. 10 |      |

**1.6** Is the number 9 prime, composite, or neither?

- |          |              |            |
|----------|--------------|------------|
| a. prime | b. composite | c. neither |
|----------|--------------|------------|

**1.7** Is the number 1 prime, composite, or neither?

- |          |              |            |
|----------|--------------|------------|
| a. prime | b. composite | c. neither |
|----------|--------------|------------|

**1.8** Is the number 41 prime, composite, or neither?

- |          |              |            |
|----------|--------------|------------|
| a. prime | b. composite | c. neither |
|----------|--------------|------------|

**1.9** Is the number 28 prime, composite, or neither?

- |          |              |            |
|----------|--------------|------------|
| a. prime | b. composite | c. neither |
|----------|--------------|------------|

**1.10** Is the number 17 prime, composite, or neither?

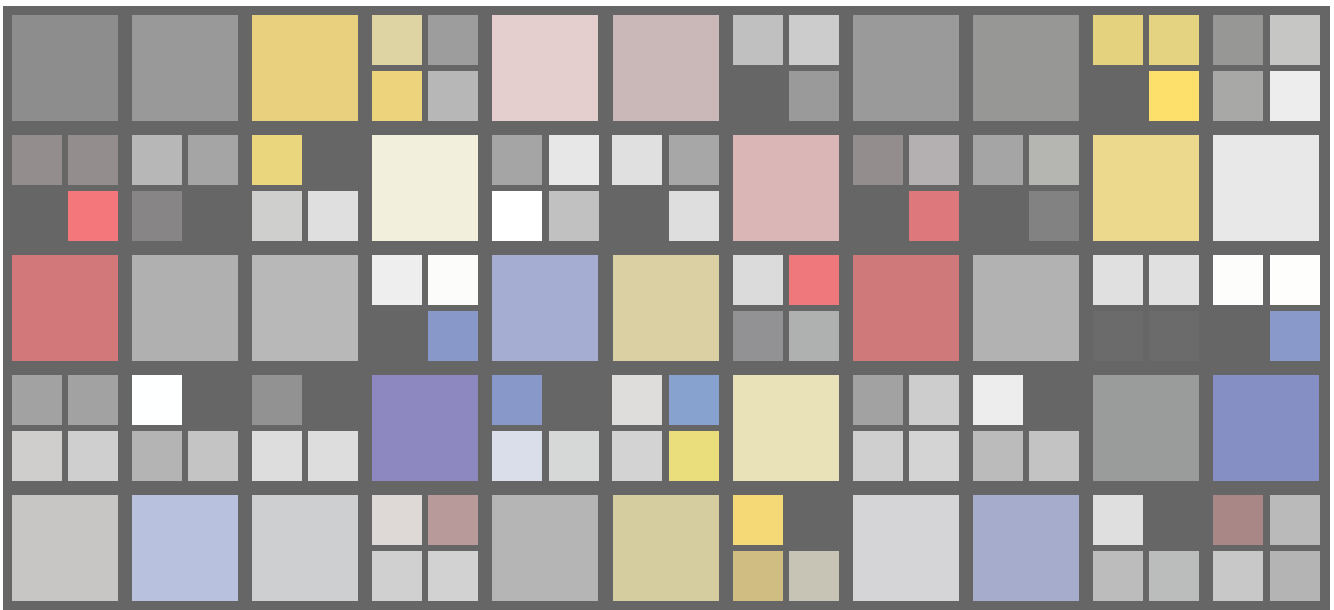
- |          |              |            |
|----------|--------------|------------|
| a. prime | b. composite | c. neither |
|----------|--------------|------------|

- 1.11** Which of the following lists all the factors of 36?
- a. 1, 2, 3, 4, 6, 12, 36                      b. 1, 2, 3, 4, 5, 6, 7, 9, 12, 36
- c. 2, 3, 4, 6, 9                                  d. 1, 2, 3, 4, 6, 9, 12, 36
- 1.12** Which of the following numbers is 20 divisible by? (There may be more than one correct answer.)
- a. 2                      b. 3                      c. 4                      d. 5
- e. 6                      f. 9                      g. 10



**Complete these activities.**

- 1.13** List all the factors of 56. Tell whether 56 is prime or composite.
- Factors: \_\_\_\_\_
- Prime or composite? \_\_\_\_\_
- 1.14** List all the factors of 15. Tell whether 15 is prime or composite.
- Factors: \_\_\_\_\_
- Prime or composite? \_\_\_\_\_
- 1.15** List all the factors of 19. Tell whether 19 is prime or composite.
- Factors: \_\_\_\_\_
- Prime or composite? \_\_\_\_\_



# SELF TEST 1: FACTORS

Each numbered question = 6 points

Answer *true or false*.

1.01 \_\_\_\_\_ The number 1 is prime.

1.02 \_\_\_\_\_ The number 78 is divisible by 2 and 3.

Circle the correct letter and answer.

1.03 The number 9 is \_\_\_\_\_ .

- a. prime                      b. composite

1.04 The number 11 is \_\_\_\_\_ .

- a. prime                      b. composite

1.05 Which of the following lists does *not* include all the factors of the bold number?

- a. **10**: 1, 2, 5, 10                      b. **5**: 1, 5  
c. **4**: 1, 2, 4                              d. **21**: 1, 21

1.06 What is the GCF of 6 and 14?

- a. 1                              b. 2                              c. 3                              d. 4

1.07 What is the GCF of 12, 4, and 28?

- a. 1                              b. 2                              c. 4                              d. 6

1.08 Which of the following numbers has a prime factorization of  $2 \times 5 \times 5$ ?

- a. 50                              b. 20                              c. 30                              d. 15

1.09 What is the prime factorization of 64?

- a.  $2 \times 2 \times 2 \times 2 \times 2$                       b.  $2 \times 2 \times 2 \times 3$   
c.  $2 \times 2 \times 2 \times 2 \times 2 \times 3$                       d.  $2 \times 2 \times 2 \times 2 \times 2 \times 2$

1.010 What is the prime factorization of 33?

- a.  $1 \times 33$                       b.  $3 \times 11$                       c.  $3 \times 13$                       d.  $3 \times 3 \times 3$

1.011 Which of the following numbers is 120 divisible by? (There may be more than one correct answer.)

- a. 2                              b. 3                              c. 4                              d. 5  
e. 6                              f. 9                              g. 10                              h. 13

**Complete these activities.**

**1.012** Find the GCF of 12 and 27. \_\_\_\_\_

**1.013** Find the GCF of 18 and 11. \_\_\_\_\_

**1.014** List all the factors of 12.  
\_\_\_\_\_

**1.015** List all the factors of 27.  
\_\_\_\_\_

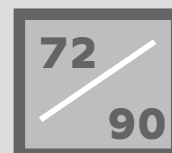


**Teacher check:**

Score \_\_\_\_\_

Initials \_\_\_\_\_

Date \_\_\_\_\_





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