Begin by having each student draw a $10 \times 10$ square on grid paper. Tell students that the square represents one whole. Have them divide the square into 10 equal parts.

Direct students’ attention to the examples in the lesson and discuss how tenths and hundredths can be written using words, fractions, and decimals.

TRY THESE Exercises 1–4 model the type of exercises students will find on the Practice on Your Own page.

- **Exercises 1–2** Fractions and decimals less than one
- **Exercises 3–4** Fractions and decimals greater than one

PRACTICE ON YOUR OWN Review the example at the top of the page. Ask questions to be sure that students understand the definitions of tenths and hundredths.

CHECK Determine if students can write a fraction or a mixed number and the equivalent decimal.

Success is indicated by 3 out of 4 correct responses.

Students who successfully complete the Practice on Your Own and Check are ready to move to the next skill.

COMMON ERRORS

- Students may confuse the decimal places and write one and six hundredths as 1.6, instead of as 1.06.
- Students may not understand decimal equivalents and write 50 hundredths as 0.050, instead of as 0.50.

Students who made more than 2 errors in the Practice on Your Own, or who were not successful in the Check section, may benefit from the Alternative Teaching Strategy on the next page.
Objective: Use paper money to model ones, tenths, and hundredths

Materials: play money: 1-dollar coins, bills, dimes and pennies

Alternative Teaching Strategy

Use Money to Model Decimals

Ask: How many dimes equal 1 whole dollar? (10 dimes) What part of a dollar is 1 dime? (1 tenth)

Ask: How many pennies equal 1 whole dollar? (100 pennies) What part of a dollar is 1 penny? (1 hundredth)

Relate dollars, dimes, and pennies to ones, tenths, and hundredths by displaying these place-value chart headings.

<table>
<thead>
<tr>
<th>dollars</th>
<th>dimes</th>
<th>pennies</th>
</tr>
</thead>
<tbody>
<tr>
<td>ones</td>
<td>tenths</td>
<td>hundredths</td>
</tr>
</tbody>
</table>

Explain to the students that in this activity they will display dollars, dimes, and pennies. Then they will write the amount in words, as a fraction or mixed number, and as a decimal. Use a place-value chart to guide students to write each number three ways.

Have students display 3 dimes. As you write the dimes in the place-value chart, ask: If 1 dime is 1 tenth of a dollar, what part of a dollar is 3 dimes? (three tenths, $\frac{3}{10}$, 0.3)

<table>
<thead>
<tr>
<th>dollars</th>
<th>dimes</th>
<th>pennies</th>
</tr>
</thead>
<tbody>
<tr>
<td>ones</td>
<td>tenths</td>
<td>hundredths</td>
</tr>
<tr>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Then have students show 27 pennies. Ask: If 1 penny is 1 hundredth of a dollar, what part of a dollar is 27 pennies? (twenty-seven hundredths, $\frac{27}{100}$, 0.27)

<table>
<thead>
<tr>
<th>dollars</th>
<th>dimes</th>
<th>pennies</th>
</tr>
</thead>
<tbody>
<tr>
<td>ones</td>
<td>tenths</td>
<td>hundredths</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

Ask: What other coins can I use to show 27 hundredths? (2 dimes 7 pennies)

Repeat the activity for 1 dollar, 6 dimes and 2 dollars, 4 dimes, 7 pennies.

When students show understanding of the relationships among ones, tenths, and hundredths, give them decimal numbers and have them write the numbers in words or as fractions or mixed numbers.
Example A
This model represents one whole, or 1.
Words: one
Fraction: $\frac{1}{1}$
Decimal: 1.0

Example B
The whole is divided into 10 equal parts. 2 out of 10 parts are shaded. So, 2 tenths are shaded.
Words: two tenths
Fraction: $\frac{2}{10}$
Decimal: 0.2

Example C
The whole is divided into 100 equal parts. 43 out of 100 parts are shaded. So, 43 hundredths are shaded.
Words: forty-three hundredths
Fraction: $\frac{43}{100}$
Decimal: 0.43

Example D
This model represents one whole and 7 tenths.
Words: one and seven tenths
Mixed Number: $1 \frac{7}{10}$
Decimal: 1.7

Try These
Shade the squares. Write the fraction or mixed number. Write the decimal.

1. Shade 4 tenths. Fraction: $\frac{4}{10}$, Decimal: 0.4
2. Shade 75 hundredths. Fraction: $\frac{75}{100}$, Decimal: 0.75
3. Shade 1 and 1 tenth. Mixed Number: $1 \frac{1}{10}$, Decimal: 1.1
4. Shade 1 and 35 hundredths. Mixed Number: $1 \frac{35}{100}$, Decimal: 1.35
### Practice on Your Own

#### Skill 14

**Think:**
1 tenth is 1 of 10 equal parts
1 hundredth is 1 of 100 equal parts.

**Words:** one and twenty-six hundredths

**Mixed Number:** $1 \frac{26}{100}$

**Decimal:** 1.26

Shade the squares. Write the fractions or mixed numbers, and decimals.

1. 3 tenths
2. 7 tenths
3. 1 tenth
4. 1 and 5 tenths
5. 17 hundredths
6. 70 hundredths
7. 4 hundredths
8. 1 and 65 hundredths

**Check**

Shade the squares. Write the fractions or mixed numbers, and decimals.

9. 9 tenths
10. 1 and 6 tenths
11. 82 hundredths
12. 1 and 37 hundredths
Begin by explaining to students that they can use a pattern that will help them multiply decimals by 10, 100, and 1,000. Direct students’ attention to the first example. Explain that the multiplication sentences show the results of multiplying $10 \times 0.3$, $100 \times 0.3$, and $1,000 \times 0.3$. Emphasize that the placement of the decimal point shows a pattern that is helpful when multiplying any decimal by 10 and powers of 10. Ask: When you multiply 0.3 by 10, what is the product? (3) What happens to the decimal point? (The decimal point moves 1 place to the right, since 3 is the same as 3.0) When you multiply 0.3 by 100, what is the product? (30) What happens to the decimal point? (It moves 2 places to the right.)

Prompt students with similar questions for multiplying by 1,000.

Guide students to understand the pattern: the decimal point moves the same number of places as there are zeros in the factors 10, 100, 1,000.

Continue in a similar way for the remaining two examples. Lead students to understand that the pattern also applies when multiplying hundredths and when multiplying ones and tenths.

TRY THESE In Exercises 1–3 students use a pattern to multiply decimals by powers of 10.

- Exercise 1 Multiply tenths by 10, 100, 1,000
- Exercise 2 Multiply hundredths by 10, 100, 1,000
- Exercise 3 Multiply ones and tenths by 10, 100, 1,000

PRACTICE ON YOUR OWN Review the examples at the top of the page. Explain that although the factors are reversed, the pattern can still be used. In Exercises 1–3, students multiply decimals by powers of 10. In Exercises 4–9, students multiply decimals by powers by 10 and write how many places to move the decimal point. In Exercises 10–12, students multiply decimals by powers of 10.

CHECK Determine if students can use a pattern to multiply decimals by 10, 100, and 1,000. Success is indicated by 5 out of 6 correct responses.

Students who successfully complete the Practice on Your Own and Check are ready to move to the next skill.

COMMON ERRORS
- Students may move the decimal point an incorrect number of places.
- Students may move the decimal point to the left.

Students who made more than 3 errors in the Practice on Your Own, or who were not successful in the Check section, may benefit from the Alternative Teaching Strategy on the next page.
Explain to students that they can use a pattern to multiply money amounts by 10, 100, and 1,000. Recall that a dime is one tenth of a dollar. Ask: How do you write one tenth as a decimal? (0.1)

Display this pattern on the flip chart.

\[
\begin{align*}
10 \times 0.1 &= \$1.00 \\
100 \times 0.1 &= \$10.00 \\
1,000 \times 0.1 &= \$100.00
\end{align*}
\]

Ask: How do you write 1 dollar using a decimal? ($1.00) How do you write 10 dollars? ($10.00) How do you write 100 dollars? ($100.00)

Rewrite the pattern using decimals in the products.

\[
\begin{align*}
10 \times 0.1 &= 1.00 \\
100 \times 0.1 &= 10.00 \\
1,000 \times 0.1 &= 100.00
\end{align*}
\]

Have students look at the multiplication sentences and examine what happens to the placement of the decimal point.

Demonstrate the pattern. Show how the decimal point moves one place to the right when you multiply by 10, two places to the right when you multiply by 100, and three places to the right when you multiply by 1,000. Explain that this pattern can be used when any money amount or decimal is multiplied by 10, 100, or 1,000.

Repeat the activity for pennies, quarters, and half dollars, using the decimals 0.01, 0.25, 0.50.

When students show an understanding of the pattern with amounts less than one dollar, have them use the pattern to multiply amounts greater than one dollar.

\[
\begin{align*}
10 \times 1.20 &= \$12.00 \\
100 \times 1.20 &= \$120.00 \\
1,000 \times 1.20 &= \$1,200.00
\end{align*}
\]
Multiply Decimals by Powers of 10

Use a pattern to multiply a decimal by 10, 100, or 1,000.

**Example A**
Multiply tenths.
10 × 0.3 = 3
← Multiply by 10. Decimal point moves 1 place to the right.
100 × 0.30 = 30
← Multiply by 100. Decimal point moves 2 places to the right.
1,000 × 0.300 = 300
← Multiply by 1,000. Decimal point moves 3 places to the right.

**Example B**
Multiply hundredths.
10 × 0.05 = 0.5 ← 1 place to the right
100 × 0.05 = 5 ← 2 places to the right
1,000 × 0.050 = 50 ← 3 places to the right

**Example C**
Multiply ones and tenths.
10 × 1.2 = 12
100 × 1.20 = 120
1,000 × 1.200 = 1,200

**Try These**

Find the product.

1. 10 × 0.4 = __________
   100 × 0.40 = __________
   1,000 × 0.400 = __________

2. 10 × 0.06 = __________
   100 × 0.06 = __________
   1,000 × 0.060 = __________

3. 10 × 1.5 = __________
   100 × 1.50 = __________
   1,000 × 1.500 = __________
Practice on Your Own

Use a pattern to multiply by 10, 100, and 1,000.

- $0.8 \times 10 = 8$
- $0.09 \times 10 = 0.9$
  Multiply by 10. Decimal point moves 1 place to the right.

- $0.80 \times 100 = 80$
- $0.09 \times 100 = 9$
  Multiply by 100. Decimal point moves 2 places to the right.

- $0.800 \times 1,000 = 800$
- $0.090 \times 1,000 = 90$
  Multiply by 1,000. Decimal point moves 3 places to the right.

Find the product.

1. $10 \times 0.5 = _____$
2. $100 \times 0.50 = _____$
3. $1,000 \times 0.500 = _____$
4. $10 \times 0.18 = _____$
5. $100 \times 0.18 = _____$
6. $1,000 \times 0.180 = _____$
7. $7.6 \times 10 = _____$
8. $7.60 \times 100 = _____$
9. $7.600 \times 1,000 = _____$

Find the product. Tell how many places you moved the decimal to the right.

4. $10 \times 0.9 = _____$
   Move _____ place(s).
5. $0.2 \times 100 = _____$
   Move _____ place(s).
6. $1,000 \times 1.9 = _____$
   Move _____ place(s).
7. $100 \times 2.4 = _____$
   Move _____ place(s).
8. $1,000 \times 5.08 = _____$
   Move _____ place(s).
9. $0.61 \times 10 = _____$
   Move _____ place(s).

Find the product.

10. $5.7 \times 1,000 = _____$
11. $1.23 \times 10 = _____$
12. $0.07 \times 100 = _____$

Find the product.

13. $10 \times 8.9 = _____$
14. $1,000 \times 0.04 = _____$
15. $100 \times 5.38 = _____$
16. $1.6 \times 10 = _____$
17. $8.39 \times 1,000 = _____$
18. $2.7 \times 100 = _____$
Using Skill 53

OBJECTIVE Write an algebraic expression for a word expression

Direct students’ attention to the first example. Ask: What is an algebraic expression? (an expression containing numbers, operations, and variables) What are the four operations? (addition, subtraction, multiplication, division) In the word expression “the sum of 6 and n,” which word refers to the operation? (sum) To which operation does the word sum refer? (addition) In the word expression, “the sum of 6 and n,” what are the addends? (6 and n) What is the algebraic expression? (6 + n) What other way could you write the expression? (n + 6)

As you work through each word expression, have the students identify the word(s) that signify the operation used. Remind students of the importance of keeping the numbers and variables in the correct order when using subtraction or division.

In the section Writing a Word Expression for an Algebraic Expression, point out to students that each algebraic expression can be written as different word expressions. Guide students to understand that each of the word expressions represents the same algebraic expression.

TRY THESE Exercises 1–2 provide practice identifying operations in word expressions, writing algebraic expressions, and connecting algebraic expressions to word expressions.

- Exercises 1–2 Write the operation and algebraic expression.

PRACTICE ON YOUR OWN Review the example at the top of the page. Have a student tell which words indicate the operation used.

CHECK Determine if students know the operation used in word expressions and can write the algebraic expression. Success is indicated by 4 out of 4 correct responses.

Students who successfully complete the Practice on Your Own and Check are ready to move to the next skill.

COMMON ERRORS

- Students may incorrectly write a – b for a less than b, or a ÷ 45 for the quotient of 45 and a.
- For expressions that contain more than one operation, students may show only one of the operations.

Students who made more than 3 errors in the Practice on Your Own, or who were not successful in the Check section, may benefit from the Alternative Teaching Strategy on the next page.
Alternative Teaching Strategy
Words for Operations

OBJECTIVE  Use index cards to write algebraic expressions for a word expression

Write on each index card a numeric expression such as:

\[ 6 + 4 \quad 7 - 3 \quad 4 \times 2 \quad 18 \div 9 \]

Divide students into groups of four. Have one student hold up an index card. Have each student in the group read aloud the expression. Try to get students to use as many different phrases as possible. Ask students to record each phrase on an index card.

Then, for each expression, have students replace one of the numbers with a variable. For example:

\[ a + 4 \quad 7 - b \quad 4 \times t \quad m \div 9 \]

MATERIALS  index cards

Again, have each student in the group read the expression aloud using as many different phrases as they can. Record each phrase on an index card.

Next, remove the symbolic expressions. Distribute the index cards with the algebraic expressions in word form and have students write the symbolic form.

Repeat the activity in another session for expressions with more than one operation. Again, start with numeric expressions, then replace some of the numbers with variables. Repeat the steps described for expressions with one operation.
Words for Operations

Write an algebraic expression for a word expression.

Write an Algebraic Expression for a Word Expression
Read the word expression. Decide what operation to use. Then write the algebraic expression.

- the sum of 6 and \( n \)
  \[ 6 + n \]
- the product of 8 and \( n \)
  \[ 8n \]

Remember there are different forms for multiplication:
\[ 8 \times n, 8n \]

- the difference of 15 and \( b \)
  \[ 15 - b \]
- the quotient of 36 and \( n \)
  \[ \frac{36}{n} \]

Remember there are different forms for division:
\[ 2 \div 4, 4 \div 2, \frac{4}{2} \]

Think: An algebraic expression can contain one or more numbers, operations, and variables.

Write a Word Expression for an Algebraic Expression
There are different phrases that you can use to represent algebraic expressions.

<table>
<thead>
<tr>
<th>Algebraic Expression</th>
<th>Word Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 2 + n )</td>
<td>the sum of 2 and ( n )</td>
</tr>
<tr>
<td>( 2 ) increased by ( n )</td>
<td>2 plus ( n )</td>
</tr>
<tr>
<td>( 2 ) more than ( n )</td>
<td>a number ( n ) plus 2</td>
</tr>
<tr>
<td>( n - 6 )</td>
<td>the difference of ( n ) and 6</td>
</tr>
<tr>
<td>( n ) decreased by 6</td>
<td>( n ) minus 6</td>
</tr>
<tr>
<td>( 6 ) less than a number ( n )</td>
<td>6 minus ( n )</td>
</tr>
<tr>
<td>( \text{xyz} )</td>
<td>the product of ( x ), ( y ), and ( z )</td>
</tr>
<tr>
<td>( x ) times ( y ) times ( z )</td>
<td>( x ) times ( y ) times ( z )</td>
</tr>
<tr>
<td>( \frac{45}{a} )</td>
<td>the quotient of 45 and ( a )</td>
</tr>
<tr>
<td>( 45 ) divided by ( a )</td>
<td>( 45 ) divided by ( a )</td>
</tr>
</tbody>
</table>

Try These

Write the operation and algebraic expression for each word expression.

1. 5 increased by \( t \)
   Operation: 
   Algebraic expression: 

2. The difference of 12 and \( p \).
   Operation: 
   Algebraic expression: 

Go to the next side.
Sometimes there is more than one operation in an expression.

### Word Expression | Algebraic Expression
--- | ---
the difference of the product of $a$ and $b$ and 7 | $ab - 7$
$y$ less than the quotient of 64 and 8 | $\frac{64}{8} - y$

**Write the operation and algebraic expression for each word expression.**

1. **the product** of $m$ and 2  
   **Operation:** _______  
   **Algebraic expression:** _______

2. **8 less than** $x$  
   **Operation:** _______  
   **Algebraic expression:** _______

3. **the quotient** of 24 and $c$  
   **Operation:** _______  
   **Algebraic expression:** _______

4. **the sum** of 4 and $s$  
   **Operation:** _______  
   **Algebraic expression:** _______

5. **5 times** $b$  
   **Operation:** _______  
   **Algebraic expression:** _______

6. **$r$ decreased by 11**  
   **Operation:** _______  
   **Algebraic expression:** _______

**Write the letter of the word expression for the algebraic expression.**

7. $\frac{t}{5}$  
   a. the product of 5 and $t$  
   **Letter:** a.

8. $5t$  
   b. a number $t$ plus 5  
   **Letter:** b.

9. $t + 5$  
   c. $t$ decreased by 5  
   **Letter:** c.

10. $t - 5$  
    d. the quotient of $t$ and 5  
    **Letter:** d.

**Write the operation(s) and algebraic expression.**

11. the sum of 3 and the quantity 8 times $p$  
    **Operation:** _______  
    **Algebraic expression:** _______

12. the difference of the product of 7 and $n$ and 4  
    **Operation:** _______  
    **Algebraic expression:** _______

13. 6 less than the quotient of $a$ and 4  
    **Operation:** _______  
    **Algebraic expression:** _______

14. the sum of 17 and $x$  
    **Operation:** _______  
    **Algebraic expression:** _______

15. 8 less than the product of 29 and $y$  
    **Operation:** _______  
    **Algebraic expression:** _______

16. $10m$  
    a. 10 increased by $m$  
    **Letter:** a.

17. 10 + $m$  
    b. 10 times $m$  
    **Letter:** b.