

Lesson 2: Multiplication Review (3 Days)

☐ Getting Started

In this lesson, you'll review how to multiply both whole and decimal numbers. First, review some basic facts about multiplication:

- Multiplication is repeated addition. In other words, 4×3 means "4 groups of 3" and is the same as $3 + 3 + 3 + 3$.
- The numbers being multiplied are called factors, and the answer to a multiplication problem is the product.
- Multiplication can be represented in the following ways:

$$5 \times 9$$

$$5 \cdot 9$$

$$5(9)$$

You are already familiar with the multiplication symbol ($\times$), but you can also represent multiplication using something called the dot operator ($\cdot$). That means you can show "five times two" as " 5×2 " or as " $5 \cdot 2$ ". The dot operator is useful for problems involving variables, which are letters used to represent an unknown number. (You'll learn more about variables in Unit 4.) For example, " $5 \times x$ " is a little confusing since the variable " x " and the multiplication symbol look very similar. In this case, " $5 \cdot x$ " is much clearer.

You can also use parentheses to represent multiplication. When two numbers are being multiplied, you can write one inside the parentheses: $5(9)$. The two numbers are written right next to each other, and no other symbol besides the parentheses is given. The parentheses indicate that the 5 and the 9 should be multiplied.

There is one more way multiplication is represented, and it is used with problems involving those variables just mentioned. If you have a number and a variable, or two or more variables, you can write them right next to each other to show multiplication.

$6n$		$6 \times n$ or $6 \cdot n$ or $6(n)$
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It's important to note that this form can only be used if there is a variable letter involved. We don't use this form with numbers because if we did, we wouldn't know if 35 meant "thirty-five" or "three times five." How confusing would that be!

Stuff You Need

- 3-hole drilled card stock (kit)
- colored pencils
- construction paper (kit)
- glue or glue stick
- Interactive Notebook
- marker
- scissors

Ideas to Think About

- How is multiplication like repeated addition?
- How does the use of place value to write numbers make it easy to multiply or divide by powers of 10?
- How do math properties help you solve problems more easily?

Things to Know

- Multiplication is repeated addition. For example, 4×3 means "4 groups of 3" and is the same as $3 + 3 + 3 + 3$.
- The numbers being multiplied are called factors, and the answer to a multiplication problem is called the product.
- You can show multiplication using the multiplication symbol ($\times$), the dot operator ($\cdot$), or parentheses.
- A **property** of something is a characteristic that applies to all instances of that thing.
- The **commutative property of multiplication** states that you can multiply numbers in any order. For example, 3×5 has the same answer as 5×3 .
- The **associative property of multiplication** says that it doesn't matter how the factors are grouped in a multiplication problem. For example, the problem $(12 \times 2) \times 5$ can be regrouped as $12 \times (2 \times 5)$.
- The **distributive property of multiplication** states that multiplying the sum of two numbers by a factor is the same as multiplying both numbers by the factor and then adding the products.

Activities

☐ Activity 1: Multiplying Multi-digit Numbers

Just like with addition and subtraction, there is a standard algorithm that you use to solve multi-digit multiplication problems. Study the following example to review the steps used in solving a multi-digit multiplication problem.

Multiplying Multi-digit Numbers

Step 1: Write the factors in stacked form. (If one factor has more digits than the other, generally the number with more digits is stacked on top.)

$$\begin{array}{r} 46 \\ \times 27 \\ \hline \end{array}$$

Step 2: Multiply all the digits in the top factor by the ones place digit in the bottom factor. Regroup as needed.

$$\begin{array}{r} 46 \\ \times 27 \\ \hline 2 \end{array} \rightarrow \begin{array}{r} 46 \\ \times 27 \\ \hline 322 \end{array}$$

Step 3: When preparing to multiply by the tens place digit in the bottom factor, first write a zero in the ones place of the second partial product as a placeholder. This shows that the top factor is actually being multiplied by a power of ten.

$$\begin{array}{r} 46 \\ \times 27 \\ \hline 322 \\ 0 \end{array}$$

Step 4: Multiply all the digits in the top factor by the tens place digit in the bottom factor. Regroup as needed. Repeat until the top factor has been multiplied by all the digits in the bottom factor, adding zeros as place holders (one zero for tens, two zeros for hundreds, three zeros for thousands, etc.).

$$\begin{array}{r} 46 \\ \times 27 \\ \hline 322 \\ 20 \end{array} \rightarrow \begin{array}{r} 46 \\ \times 27 \\ \hline 322 \\ 920 \end{array}$$

Step 5: Add the numbers in each column of the partial products to find the final answer.

$$\begin{array}{r} 46 \\ \times 27 \\ \hline 322 \\ + 920 \\ \hline 1242 \end{array}$$

Because multiplying multi-digit numbers is a pretty important focus in early math, this algorithm is likely review for you. However, if you would like to review it a bit more, take some time to watch the video at the following web link.



Multi-Digit Multiplication Part 2

www.beyondthepage.com/link/9891/

Practice makes perfect, so use the steps in the algorithm to complete the "Multiplying Multi-digit Factors" activity sheets.

☐ Activity 2: The Distributive Property

When you're solving multiplication problems, mathematical properties can make the job easier. You have already learned the commutative property of multiplication and

the associative property of multiplication. These properties will be reviewed in this activity, and you will be introduced to another one that is equally as important.

First, what do we mean by *property*? A **property** of something is just a characteristic that applies to all instances of that thing. A property of fire is that it is hot. A property of water is that it is wet. Just about everything can be described by its properties. Mathematical things have properties as well. These mathematical properties are often stated using letters and symbols to represent their meaning.

Consider the two properties already mentioned. The **commutative property of multiplication** says that the order of the factors can be changed without changing the product. Represented with letters and symbols, this property is written:

Commutative Property

$$a \times b = b \times a$$

Example: $5 \times 7 = 7 \times 5$
 $35 = 35$

When you look at this, you understand that you can switch the order of any factor (a) with any other factor (b) and have the same answer that you had before switching them. The letters *a* and *b* just refer to two different numbers, such as the 5 and 7 shown in the example.

The **associative property of multiplication** says that grouping the factors in different ways doesn't change the product. Grouping is shown with parentheses. You may remember that math problems are solved using a set order of operations. One of the rules is that operations grouped in parentheses are completed first. The associative property can be written:

Associative Property

$$(a \times b) \times c = a \times (b \times c)$$

Example: $(2 \times 7) \times 4 = 2 \times (7 \times 4)$
 $14 \times 4 = 2 \times 28$
 $56 = 56$

Again, the letters *a*, *b*, and *c* stand for the different numbers used in a math problem. The example shows that the numbers stay in the same order, but the way they are grouped changes. This change in grouping changes the order in which the problem is solved, but the final product doesn't change.

Another important property is the distributive property. The **distributive property** states that multiplying the sum of two numbers by a factor is the same as multiplying both numbers by the factor and then adding the products together. This is much easier to show using letters and symbols.

Distributive Property

$$a(b + c) = (a \cdot b) + (a \cdot c)$$

Example: $5(6 + 9) = (5 \cdot 6) + (5 \cdot 9)$
 $5(15) = 30 + 45$
 $75 = 75$

* The distributive property may also be shown as $a(b + c) = ab + ac$

This is called the distributive property because the first factor is *distributed* to, or put with, each part of the addition problem. You'll notice that the multiplication for the distributive property formula isn't shown using either the $\times$ symbol or the dot operator ($\cdot$). Instead, the factor is written directly next to the parentheses, which you learned can also represent multiplication.

To see why the distributive property works, watch the following video and take notes on your "Modeling the Distributive Property Notes" page. Be sure to copy the drawings shown in the video's example problems carefully, using colored pencils to show the different parts. You may refer back to these notes later for review.



Modeling the Distributive Property
www.beyondthepage.com/link/10063/

Now, believe it or not, the distributive property is the reason the standard algorithm for multiplication works! Let's take the problem we solved in Activity 1: 46×27 . Using the distributive property, we can break the second factor, 27, into two easier numbers, 20 and 7. The problem can then be written as $46 \times (20 + 7)$. The 46 then distributes to, or multiplies by, each of the two numbers.

$$\begin{aligned} &46 \times (20 + 7) \\ &(46 \times 20) + (46 \times 7) \\ &920 + 322 \\ &1,242 \end{aligned}$$

Now, look again at the problem solved using the standard algorithm. Do you notice anything similar?

$$\begin{array}{r} 46 \\ \times 27 \\ \hline \end{array} \Rightarrow \begin{array}{r} 46 \\ \times 27 \\ \hline 2 \end{array} \Rightarrow \begin{array}{r} 46 \\ \times 27 \\ \hline 322 \end{array} \Rightarrow \begin{array}{r} 46 \\ \times 27 \\ \hline 322 \\ 20 \end{array} \Rightarrow \begin{array}{r} 46 \\ \times 27 \\ \hline 322 \\ 920 \end{array} \Rightarrow \begin{array}{r} 46 \\ \times 27 \\ \hline 322 \\ 920 \\ + 920 \\ \hline 1242 \end{array}$$

You should notice that the partial products computed in the standard algorithm are the same numbers found when the distributive property is applied. The algorithm works because it is actually an application of the distributive property. This fact gives you options, then, in how you solve a multi-digit multiplication problem. Let's try one in the form of a word problem.



A basketball uniform costs \$24. If the coach needs to buy uniforms for 12 players, how much will all of the uniforms cost?

To solve, you can use the distributive property or the standard algorithm.

Distributive Property

$$\begin{aligned} 12 \times 24 \\ 12 \times (20 + 4) \\ (12 \times 20) + (12 \times 4) \\ 240 + 48 \\ \$288 \end{aligned}$$

Standard Algorithm

$$\begin{array}{r} 12 \\ \times 24 \\ \hline 48 \\ + 240 \\ \hline \$288 \end{array}$$

It's helpful to have multiple tools for solving math problems. There will be times you find the standard algorithm easier to use, and other times when the distributive property will be the better choice. Complete the "Multiplication and the Distributive Property" activity sheet.

When you have finished, discuss the distributive property with a parent and then store the page in your Interactive Notebook. Be sure to keep an eye out for more ways the distributive property helps us solve problems in future lessons.

Day 2

☐ Activity 3: Multiplying with Powers of Ten Shortcut

Both the distributive property and the standard algorithm are good ways to solve multi-digit multiplication problems, and you definitely want to be able to use both of these methods accurately.

However, sometimes there are mental shortcuts that you can take in math called using mental math. They can make finding the solution to a problem easier and

quicker. You probably use a lot of mental math already. What are the answers to these problems?

- $3 \times 10 =$
- $26 \times 100 =$

You should have found the answers to be 30 and 2,600. Chances are that you did not write down all the partial products for these problems using the standard algorithm. Instead you used mental math to calculate the answers using what you know about multiplying by powers of ten.

Can that same shortcut be used to multiply a number with a decimal, such as 4.5? Or does it work with a power of ten less than 1, such as 0.01? Watch the following video to learn how the "multiplying by powers of ten" shortcut can be used to quickly solve certain multiplication problems.



Multiplying Decimals by Powers of 10

www.beyondthepage.com/link/10038/

The video demonstrates how to multiply whole and decimal numbers by powers of ten that are greater than 1, such as 10, 100, and 1,000. To do this, you simply count the number of zeros and move the decimal that many places to the *right*. But why count the zeros?

In a base-ten number system, like the one we use, each place value is 10 times larger than the one before it. That means 10 is ten times larger than 1, and 100 is ten times larger than 10, and so forth. So, each additional zero in a power of ten represents an additional place value above one.

When you move the decimal number to match the number of zeros, you are really adjusting the place values of the digits by powers of ten. This is often referred to as the "moving the decimal point trick."

$$8.92 \times 100 \xleftarrow{10 \times 10}$$

8.92 multiplied by two powers of ten = 892

$$8.92 \times 100 \xleftarrow{\text{two zeros}}$$

The decimal moves two place values = 892

Just as there are powers of ten more than one, there are also powers of ten less than one, such as $1/10$, $1/100$, and $1/1000$. How does the shortcut work with those numbers? If these powers of ten are represented as fractions, you can still count the

zeros shown in the denominator, but you'd have to move the decimal to the *left* because the place values are less than 1, so the number you are working with gets smaller. However, if the power of ten less than one is shown in decimal form, you have to do a little more thinking.

Study this example:

You can also simply count the place values shown in the decimal power of ten to find the number of times to move the decimal point to the left in your other number. In the previous example, 0.1 shows one place value behind the decimal (tenths), so you move the decimal point in 93 one time. Use the method that works the best for you.

 WRITE	$93 \times 0.1 =$
 THINK	"0.1 means one-tenth, or $\frac{1}{10}$. There is 1 zero in the ten."
 SOLVE	Move the decimal 1 place value to the left. 9.3

Complete the "Multiplying by Powers of Ten" activity page. When you have completed it, cut out the top section and glue it to a piece of card stock. Place this in your Interactive Notebook for future reference.

☐ Activity 4: Multiplication Properties and Powers of Ten

In this lesson, you've learned how to use properties of multiplication, and you've discovered a shortcut for multiplying with powers of ten. In this activity, you'll put those two skills together.

Think about these problems that you can probably do in your head. What is 6×7 ? Correct, the answer is 42. Now, what's the product of 6×70 ? You probably quickly found the answer to be 420. But, have you ever thought about why that works? Study the following image to see how this can be explained using the distributive property and the powers of ten shortcut.

$$\begin{aligned}
 6 \times 70 &= 6 \times (7 \times 10) \quad \leftarrow \text{The number 70 can be rewritten with a power of ten as } 7 \times 10. \\
 &= (6 \times 7) \times 10 \quad \leftarrow \text{The associative property allows you to first multiply } 6 \times 7. \\
 &= 42 \times 10 \\
 &= 420 \quad \leftarrow \text{The "moving the decimal" trick lets you move the decimal to make the number one place value larger.}
 \end{aligned}$$

So if you can rewrite a multiplication problem using a power of 10 (e.g., 10, 100, 1000, etc.), you can use the "moving the decimal point" trick to complete the multiplication problem.

This also works when multiplying by powers of 10 that are *less* than one. In these cases, you move the decimal point to the left. For example, if you know that $6 \times 7 = 42$, then you can quickly find that $6 \times 0.7 = 4.2$.

$$\begin{aligned}
 6 \times 0.7 &= 6 \times (7 \times 0.1) \leftarrow \text{power of ten} \\
 &= (6 \times 7) \times 0.1 \leftarrow \text{associative property} \\
 &= 42 \times 0.1 \\
 &= 4.2 \quad \leftarrow \text{"moving the decimal" trick}
 \end{aligned}$$

Again, this example shows how you can rewrite the multiplication problem using a power of 10 number (0.1), and then use the "moving the decimal point" trick to complete the multiplication.

Now, let's add one more skill you've learned to this type of problem. First, use the standard algorithm to multiply.

What is the product of 36×27 ?

Now find the answer using the distributive property.

Standard Algorithm

$$\begin{array}{r}
 36 \\
 \times 27 \\
 \hline
 252 \\
 + 720 \\
 \hline
 972
 \end{array}$$

Distributive Property

$$\begin{aligned}
 &36 \times 27 \\
 &36(20 + 7) \\
 &(36 \times 20) + (36 \times 7) \\
 &720 + 252 \\
 &972
 \end{aligned}$$

The product of 36×27 is 972. From here, we can use the other skills to find the answers to all sorts of related problems, such as:

- $360 \times 27 =$
- $36 \times 2.7 =$
- $36 \times 2700 =$
- $0.36 \times 27 =$
- $0.36 \times 0.27 =$

The first thing to do is rewrite each problem so that at least one of the factors uses a power of ten. You can think of it as breaking down a whole into its different parts.

Take a look at the first problem.

The problem:

$$360 \times 27 =$$

Rewrite and Solve:

1. $(36 \times 10) \times 27 =$	360 is rewritten to show a power of ten.
2. $36 \times 27 \times 10 =$	The factors 27 and 10 are switched with the commutative property.
3. $972 \times 10 =$	The product of 36 and 27 is 972.
4. $972 \times 10 = 9,720$	The decimal point moves one place to the right using the power of ten shortcut.

Sometimes it won't be obvious which number can be rewritten with a power of ten, but if you remember that powers of ten indicate place values, you may have another clue to help you. See this example for proof:

The problem:

$$36 \times 2.7 =$$

Rewrite and Solve:

1. $36 \times (27 \times 0.1) =$	2.7 is rewritten to show a power of ten.
2. $(36 \times 27) \times 0.1 =$	The associative property allows you to regroup the factors.
3. $972 \times 0.1 =$	The product of 36 and 27 is 972.
4. $972 \times 0.1 = 97.2$	The decimal point moves one place to the left using the power of ten shortcut.

Use these same steps to find the answers to the other problems that relate to 36×27 . You may want to ask a parent to watch you work through these to make sure your steps are correct. Remember that each problem in this set should be rewritten to include $36 \times 27 \times$ a power of ten. You don't have to recalculate the product of 36×27 every time, since you already know it is 972.

Now, continue to practice using the "Moving the Decimal Point Trick" activity sheet.

Day 3**Activity 5: Using the Standard Multiplication Algorithm with Decimal Numbers**

The last several activities were designed to show you the steps that work together to form the standard algorithm for multiplying decimal numbers. As you solve decimal multiplication problems from this point on, you won't separately identify each step, but you will be using them as you work the problem to achieve the correct answer.

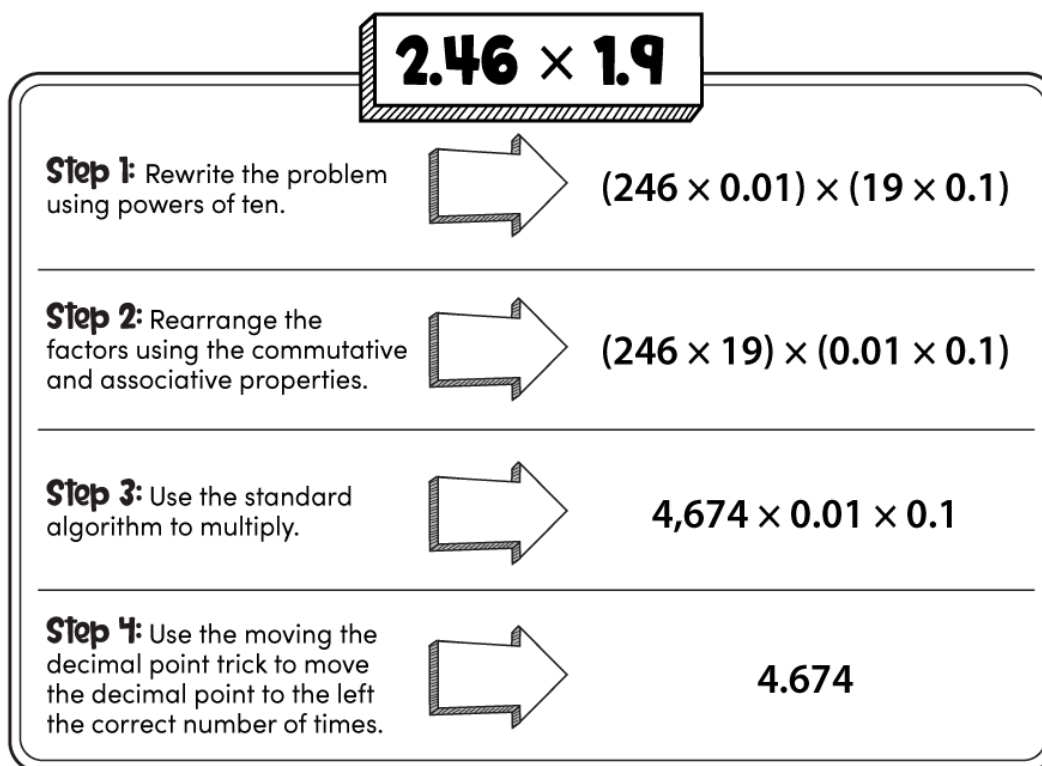
You already know the standard multiplication algorithm for multi-digit numbers. This same algorithm can be used to multiply decimal numbers with just one extra step added. Watch the video at following web link to see how the algorithm works.

**Decimal Multiplication**

www.beyondthepage.com/link/10058/

Stop the video at the 7:50 mark.

To multiply decimal numbers, all you do is multiply the digits using the standard algorithm, and then move the decimal point in the answer to match the decimal place values in the factors. Let's break a problem down to show the different steps at work.



Now let's do the problem using the standard algorithm.

2.46×1.9

Step 1: Write the factors in vertical form. Do not line up the decimal points.		$\begin{array}{r} 2.46 \\ \times 1.9 \\ \hline \end{array}$
Step 2: Find the partial products using the standard algorithm for multiplication.		$\begin{array}{r} 2.46 \\ \times 1.9 \\ \hline 2214 \\ 2460 \\ \hline \end{array}$
Step 3: Add the partial products to find the digits in the product.		$\begin{array}{r} 2.46 \\ \times 1.9 \\ \hline 2214 \\ + 2460 \\ \hline 4674 \end{array}$
Step 4: Count the number of digits behind decimal points in the factors. Move the decimal point to the left in the product that many times.		$\begin{array}{r} 2.46 \\ \times 1.9 \\ \hline 2214 \\ + 2460 \\ \hline 4.674 \end{array}$

When you multiply decimal numbers using the standard algorithm, you are automatically incorporating the multiplication properties and the powers of ten shortcut as you perform the steps. The algorithm puts all the skills together in an organized way.

Now you will create a foldable for your Interactive Notebook showing the steps for the decimal multiplication algorithm. Follow these steps to create your page:

1. Cut out the boxes from the "Multiplication Algorithm Foldable" sheet.
2. Put the steps in the correct order, and match the correct example problem image with each one.
3. Once you've put the steps and matching examples in order, show them to a parent and explain each step in your own words.
4. Shade each step and its corresponding example in the same color, using a different colored pencil for each step.
5. Cut about 2 inches off of the long end of a piece of construction paper so the page is about 9" × 10".

6. Fold the sheet of construction paper in half. (Refer to the image in Lesson 1 as needed.)
7. Cut the top half into 4 equal sections to create the flaps.
8. Use a marker to write "Step 1", "Step 2", "Step 3", and "Step 4" onto the front of the flaps.
9. Lift the flaps and glue the steps and the examples in the correct order. The step should go on the back of the flap and the example should go below the step. (Refer to the image in Lesson 1 as needed.)
10. Cut out the title along the dotted lines and optionally color it. Then paste the title box and your completed foldable to a sheet of card stock paper. Store this in your Interactive Notebook.

Store the foldable in your Interactive Notebook. You may wish to refer to it as you solve the problems in the next activity.

☐ **Activity 6: Practice with Multiplying Decimal Numbers**

All skills improve with practice, so sharpen your skills as you complete the practice problems on the "Multiplying Decimal Numbers" activity sheet. You may wish to refer to your algorithm foldable as you work.

Wrapping Up

In this lesson, you reviewed some facts about multiplication and practiced using the standard multiplication algorithm to multiply multi-digit decimal numbers. This skill is useful in the real world for tasks like calculating the area of a garden ($\text{length} \times \text{width}$) or figuring out how much it will cost to buy multiple items of the same price.

In the next lesson you'll review decimal number division.

Learning Gates

Take the [Learning Gates quiz](#) for this lesson.

Multiplying Multi-digit Factors

Instructions: Use the standard multiplication algorithm to find the product for each problem.

1.

$47 \times 35 =$

2.

$53 \cdot 64 =$

3.

$769(8) =$

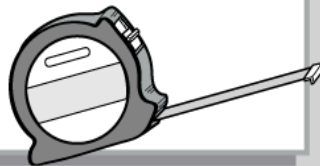
4.

$379 \cdot 34 =$

5.

$2,563 \times 28 =$

6. A rectangular plot of land is 80 feet long and 55 feet wide. What is the area of this plot of land? (Area = length $\times$ width)



7. A poetry magazine is 52 pages long. The magazine publisher decides to print 850 copies. How many total pages will be printed?



8. Breanna earns \$125 a week. If she works for 48 weeks, how much money will she earn?



9. What are the four ways to represent the multiplication problem "4 times n "? (Remember that n is a variable that represents an unknown number.)





Modeling the Distributive Property Notes

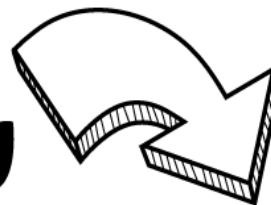
1.

$$4(2+5)$$

2.

$$3(6+1)$$

Multiplication and the Distributive Property



DEFINE IT!

The distributive property states that multiplying the sum of two numbers by a factor is the same as multiplying both numbers by the _____ and then _____ the products together.

$$a(b + c) = (a \cdot b) + (a \cdot c)$$

SHOW IT!

Instructions: Use the grid to illustrate how the distributive property works.

$$3(3 + 2)$$

$$(3 \times 3) + (3 \times 2)$$

PRACTICE IT!

Instructions: Use the distributive property to solve the problems.

$$6(6 + 7)$$

$$9(10 + 4)$$

$$2(7 + 4 + 8)$$

APPLY IT!

Instructions: Solve the problem using the standard algorithm and the distributive property.

$$53 \times 24$$

Multiplying by Powers of Ten

Rules:

- To multiply a number by a power of ten, count the number of _____ and move the _____ point that number of times.
- If the power of ten is **more than** _____, move the decimal point to the _____.
- If the power of ten is **less than** _____, move the decimal point to the _____.

Examples:

Use a colored pencil to circle the number of zeros or the place value indicators, and then use the same color to show the decimal moving.

Models: $7.8 \times 10 = 78$

$94 \times 0.01 = 0.94$

$6.524 \times 100 =$ _____

$7.9 \times 0.1 =$ _____

$0.005 \times 1000 =$ _____

$1.8 \times 0.001 =$ _____

↪ Cut out to save!

Instructions: Use the multiplying by powers of ten rules to find the products.

1) $78 \times 100 =$ _____

5) $8.2 \times 0.1 =$ _____

2) $8.3 \times 10 =$ _____

6) $39.25 \times 0.01 =$ _____

3) $0.45 \times 1000 =$ _____

7) $7 \times 0.001 =$ _____

4) $0.0875 \times 100 =$ _____

8) $0.06 \times 0.01 =$ _____

9) Kayla earns \$5.25 for each hour she babysits. If she babysits 100 hours over the summer, how much money will she earn?

10) Jason has 175 pieces of candy. Each piece of candy weighs a hundredth of a pound (0.01). How much does all the candy weigh together?

Moving the Decimal Point Trick

Instructions: Use the fact that $23 \times 17 = 391$ to find the following products.
(Hint: You should first rewrite each problem to include a power of ten.)



1) 230×17

2) 23×1.7

3) Franco saves \$1700 a year. How much money will he save after 23 years?

4) 2.3×1.7

5) 0.23×1.7

6) If each Tidbit Toy weighs 0.17 ounces, how much will 23 Tidbit Toys weigh?

MULTIPLICATION ALGORITHM FOLDABLE

Find the partial products using the standard multiplication algorithm for multi-digit numbers.

$$\begin{array}{r} 8.7 \\ \times .34 \\ \hline \end{array}$$

Count the number of digits behind the decimal point for each factor. Move the decimal point in the product to the left that many places.

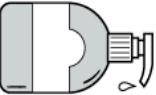
$$\begin{array}{r} 8.7 \\ \times .34 \\ \hline 348 \\ + 2610 \\ \hline 2958 \end{array}$$

Add the partial products to find the digits in the product.

$$\begin{array}{r} 8.7 \\ \times .34 \\ \hline 348 \\ 2610 \\ \hline \end{array}$$

Stack the factors vertically. Decimal points do NOT need to be lined up.

$$\begin{array}{r} 8.7 \leftarrow 1 \\ \times .34 \leftarrow 2 \\ \hline 348 \\ + 2610 \\ \hline 2.958 \leftarrow 3 \end{array}$$

MULTIPLYING DECIMAL NUMBERS				
Instructions: Use the standard multiplication algorithm to multiply these numbers.				
1) $74 \times 5.8 =$	2) $8.6 \times 0.4 =$	3) $5.2 \times 0.64 =$	4) $0.39 \times 0.44 =$	
5) Tony travels by airplane to visit his grandparents. The trip is 625.3 miles long. If Tony takes this trip by plane 8 times, how many total miles will he have traveled?	6) Kamal needs to fill 65 bottles with 3.65 fluid ounces of shampoo. How many fluid ounces of shampoo will Kamal need in all?	7) Lindy's painting is 16.9 inches long and 9.3 inches wide. What is the area of her painting? (Area = length $\times$ width)	8) Alexa needs to buy 45 soccer balls for the community soccer league. Each ball costs \$11.95. How much will Alexa spend on the soccer balls?	
				

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- The **distributive property of multiplication** states that multiplying the sum of two numbers by a factor is the same as multiplying both numbers by the factor and then adding the products.

⦿ Skills

- Compute fluently with multi-digit numbers
- Apply properties of operations as strategies to multiply rational numbers
- Fluently multiply multi-digit decimals using the standard algorithm
- Solve real-world and mathematical problems involving the four operations with rational numbers

Introducing the Lesson

In this lesson your child will review and practice multiplying multi-digit whole and decimal numbers. She should already have mastered her multiplication fact (times tables) through 12. If she would benefit from reviewing these facts, she can use the multiplication practice tool at the following web link:



Multiplication Practice

www.beyondthepage.com/link/9672/

The "Family Quizzes" section allows your child to focus on specific numbers (like $\times 11$ or $\times 12$ problems). If she would benefit from general practice, choose 12 in the "Up-Through Quizzes" section.

Activities**Activity 1: Multiplying Multi-digit Numbers**

Your child will review the standard algorithm used to multiply multi-digit numbers. This algorithm was taught in previous levels, so your child's goal at this point should be fluency and accuracy. If more review is needed, encourage her to watch the video provided in the student section. She may also work practice problems if needed at the following link:

**Two-digit multiplication practice**

www.beyondthepage.com/link/10036/

Answer Key:

1. $47 \times 35 = 1,645$
2. $53 \cdot 64 = 3,392$
3. $769(8) = 6,152$
4. $379 \cdot 34 = 12,886$
5. $2,563 \times 28 = 71,764$
6. A rectangular plot of land is 80 feet long and 55 feet wide. What is the area of this plot of land? (4,400 square feet) $80 \times 55 = 4,400$
7. A poetry magazine is 52 pages long. The magazine publisher decides to print 850 copies. How many total pages will be printed? (44,200 pages) $850 \times 52 = 44,200$
8. Breanna earns \$125 a week. If she works for 48 weeks, how much money will she earn? (\$6,000) $\$125 \times 48 = \$6,000$
9. What are the four ways to represent the multiplication problem "4 times n"? ($4 \times n$; $4 \cdot n$; $4(n)$; $4n$)

Activity 2: The Distributive Property

Your child will review the commutative and associative properties and will learn about the distributive property and how it is used in the standard algorithm for multiplication. This property is used in numerous ways in mathematics and will show up again in later lessons. Discuss your child's Interactive Notebook page with her, and be sure to listen carefully as she explains the property to you. Note that letters are used to write the formulas of the math properties. A formal introduction to variables (letters representing numbers) will come in a later unit, so for now, just make sure she understands that the letters can represent any number. You should also continue to accept the use of the multiplication symbol $\times$ in your child's answers while encouraging her to become familiar with the other ways multiplication can be represented.

"Multiplication and the Distributive Property" Answer Key**DEFINE IT!**

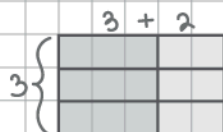
The distributive property states that multiplying the sum of two numbers by a factor is the same as multiplying both numbers by the factor and then adding the products together.

$$a(b + c) = (a \cdot b) + (a \cdot c)$$

SHOW IT!

Instructions: Use the grid to illustrate how the distributive property works.

$$3(3 + 2)$$



$$(3 \times 3) + (3 \times 2)$$

**PRACTICE IT!**

Instructions: Use the distributive property to solve the problems.

$$6(6 + 7)$$

$$(6 \cdot 6) + (6 \cdot 7)$$

$$36 + 42$$

$$78$$

$$9(10 + 4)$$

$$(9 \cdot 10) + (9 \cdot 4)$$

$$90 + 36$$

$$126$$

$$2(7 + 4 + 8)$$

$$(2 \cdot 7) + (2 \cdot 4) + (2 \cdot 8)$$

$$14 + 8 + 16$$

$$38$$

APPLY IT!

Instructions: Solve the problem using the standard algorithm and the distributive property.

$$53 \times 24$$

$$\begin{array}{r} 53 \\ \times 24 \\ \hline 212 \\ + 1060 \\ \hline 1272 \end{array}$$

$$\begin{aligned} 53 \times 24 &= 53(20 + 4) \\ &= (53 \cdot 20) + (53 \cdot 4) \\ &= 1060 + 212 \\ &= 1272 \end{aligned}$$

Day 2**Activity 3: Multiplying with Powers of Ten Shortcut**

Your child will use what she has previously learned about multiplying by powers of ten to learn how to apply a "shortcut" to decimal multiplication. This skill provides a stepping stone to help her understand why the algorithm for decimal multiplication works. In addition, this skill promotes the development of mental math. As your child develops, encourage her to do more basic computations "in her head" rather than relying strictly on pencil and paper. However, if she is not yet comfortable with mental math, don't force it. Encourage her to try, but allow her to continue to build math confidence by finding the correct answers in the ways she is most comfortable.

After she completes the activity sheet problems, have her cut out the top section of the sheet and glue it onto a piece of card stock. She should store this in her Interactive Notebook for future reference.

Answer Key:

- To multiply a number by a power of ten, count the number of zeros and move the decimal point that number of times.
- If the power of ten is more than one, move the decimal point to the right.
- If the power of ten is less than one, move the decimal point to the left.

$$6.524 \times 100 = 652.4$$

$$7.9 \times 0.1 = 0.79$$

$$0.005 \times 1000 = 5$$

$$1.8 \times 0.001 = 0.0018$$

- $1.78 \times 100 = 178$
- $8.3 \times 10 = 83$
- $0.45 \times 1000 = 450$
- $0.0875 \times 100 = 8.75$
- $8.2 \times 0.1 = 0.82$
- $39.25 \times 0.01 = 0.3925$
- $7 \times 0.001 = 0.007$
- $0.06 \times 0.01 = 0.0006$
- Kayla earns \$5.25 for each hour she babysits. If she babysits 100 hours over the summer, how much money will she earn? (\$525) $\$5.25 \times 100 = \$525$
- Jason has 175 pieces of candy. Each piece of candy weighs a hundredth of a pound (0.01). How much does all the candy weigh together? (1.75 pounds) $175 \times 0.01 = 1.75$

Activity 4: Multiplication Properties and Powers of Ten

Your child will learn how to use the standard algorithm, the properties of multiplication, and the powers of ten shortcut to solve more complex decimal problems. This process may be very different than what she is used to. Encourage her to see the value in trying new methods and promote the benefit of being able to use mental math processes. To help ensure that she understands the steps in this process, you may wish to observe her as she works the example problems. You may answer any questions she has or offer suggestions if she gets stuck.

- $36 \times 2700 = 36 \times (27 \times 100) = (36 \times 27) \times 100 = 972 \times 100 = 97,200$
- $0.36 \times 27 = (36 \times 0.01) \times 27 = (36 \times 27) \times 0.01 = 972 \times 0.01 = 9.72$
- $0.36 \times 0.27 = (36 \times 0.01) \times (27 \times 0.01) = (36 \times 27) \times 0.01 \times 0.01 = 972 \times 0.01 \times 0.01 = 0.0972$

This activity prepares your child to learn the standard algorithm for multiplying decimals and helps her understand why the algorithm works. After the guided practice in the activity, she will likely be ready to practice on her own with the activity sheet. If you'd like to view another source of information about these types of problems, please visit the following webpage.



Reasoning about Multiplication and Division and Place Value

www.beyondthepage.com/link/9447/

You can find more info on these types of problems at this webpage.

Answer Key:

- $230 \times 17 = (23 \times 10) \times 17 = (23 \times 17) \times 10 = 391 \times 10 = 3,910$
- $23 \times 1.7 = 23 \times (17 \times 0.1) = (23 \times 17) \times 0.1 = 391 \times 0.1 = 39.1$
- Franco saves \$1700 a year. How much money will he save after 23 years? (\$39,100)
 $23 \times 1700 = 23 \times (17 \times 100) = (23 \times 17) \times 100 = 391 \times 100 = 39,100$
- $2.3 \times 1.7 = (23 \times 0.1) \times (17 \times 0.1) = (23 \times 17) \times 0.1 \times 0.1 = 391 \times 0.1 \times 0.1 = 3.91$
- $0.23 \times 1.7 = (23 \times 0.01) \times (17 \times 0.1) = (23 \times 17) \times 0.01 \times 0.1 = 391 \times 0.01 \times 0.1 = 0.391$
- If each Tidbit Toy weighs 0.17 ounces, how much will 23 Tidbit Toys weigh? (3.91 ounces)
 $23 \times 0.17 = (23 \times (17 \times 0.01)) = (23 \times 17) \times .01 = 391 \times 0.01 = 3.91$

Day 3

Activity 5: Using the Standard Multiplication Algorithm with Decimal Numbers

Your child will learn the standard algorithm for multiplying decimal numbers. This process incorporates the other skills learned in this lesson in an organized flow. Your child will make a foldable about this algorithm for her Interactive Notebook. The algorithm steps should be in the following order:

- Stack the factors vertically. Decimal points do NOT need to be lined up. (Paired with image of the two factors with their decimal points circled.)
- Find the partial products using the standard multiplication algorithm for multi-digit numbers. (Paired with the image of the individual products in a bracket.)
- Add the partial products to find the digits in the product. (Paired with the image that has an arrow pointing to the product.)
- Count the number of digits behind the decimal point for each factor. Move the decimal point in the product to the left that many places. (Paired with the image that has arrows labeled 1, 2, and 3.)

Activity 6: Practice with Multiplying Decimal Numbers

Your child will develop her skills by completing a page of practice problems. Allow her to refer to the decimal multiplication algorithm foldable as needed to ensure she follows the correct steps used in finding the answers.

Answer Key:

- $74 \times 5.8 = 429.2$
- $8.6 \times 0.4 = 3.44$
- $5.2 \times 0.64 = 3.328$
- $0.39 \times 0.44 = .1716$
- Tony travels by airplane to visit his grandparents. The trip is 625.3 miles long. If Tony takes this trip by plane 8 times, how many total miles will he have traveled? (5,002.4 miles) $625.3 \times 8 = 5,002.4$
- Kamal needs to fill 65 bottles with 3.65 fluid ounces of shampoo. How many fluid ounces of shampoo will Kamal need in all? (237.25 fluid ounces) $65 \times 3.65 = 237.25$

7. Lindy's painting is 16.9 inches long and 9.3 inches wide. What is the area of her painting? (157.17 square inches) $16.9 \times 9.3 = 157.17$
8. Alexa needs to buy 45 soccer balls for the community soccer league. Each ball costs \$11.95. How much will Alexa spend on the soccer balls? (\$537.75) $45 \times \$11.95 = \$537.75$

Wrapping Up

Questions to Discuss

- What does the commutative property of multiplication allow you to do? Give an example. (The commutative property of multiplication allows you to multiply the factors of a multiplication problem in any order. For example, 6×2 is the same as 2×6 .)
- What does the associative property of multiplication allow you to do? Give an example. (The associative property of multiplication allows you to group the factors of a multiplication problem in any order. For example, $8 \times (3 \times 2)$ can be regrouped as $(8 \times 3) \times 2$.)
- What does the distributive property of multiplication say? How is it shown using letter symbols? (The distributive property says that a factor can be broken down into easier numbers and each of those numbers is multiplied by the other factor and the products are added together. It is shown as $a(b + c) = ab + ac$.)
- Explain how the "moving the decimal point" trick is used in the standard multiplication algorithm. (You ignore the decimal point or points while multiplying, but then count the decimal point place values and move the decimal to the left that same number in the final product.)

Things to Review

- Review the algorithm for multi-digit multiplication
- Review how the commutative, associative, and distributive properties work
- Review the algorithm for multiplying multi-digit decimal numbers