CONTENTS

Introduction

Chapter 1 Numbers and Operations in Base Ten

Chapter 2 Operations and Algebraic Thinking

Chapter 3 Fractions and Decimals

Chapter 4 Measurement and Data

Chapter 5 Geometry

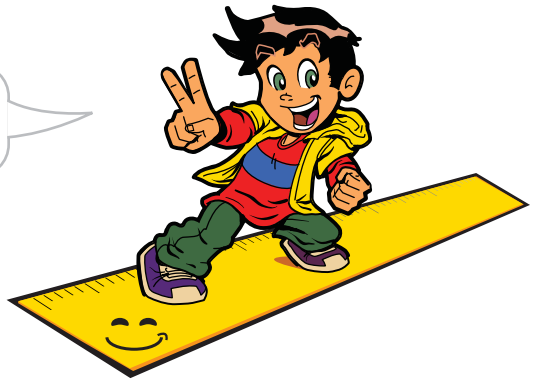
Lesson 4 Multiply Whole Numbers

Introduction

What Will I Learn?

- How do you multiply a 4-digit number by a 1-digit number?
- How do you multiply two 2-digit numbers?

You can use models and equations to help you multiply!



Break Down the Skills

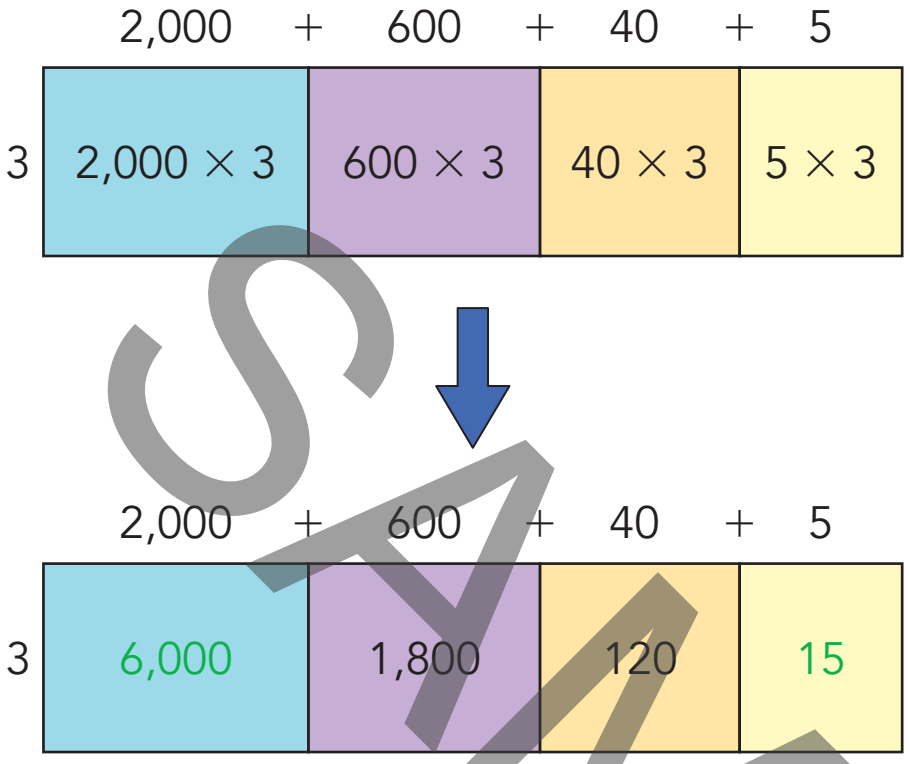
Two numbers, or two **factors**, multiplied together give a **product**.

- Breaking up one or more factors by place value allows you to find **partial products** that may then be added to find the product.

$$\begin{aligned} 2{,}645 \times 3 &= (2{,}000 \times 3) + (600 \times 3) + (40 \times 3) + (5 \times 3) \\ &= 6{,}000 + 1{,}800 + 120 + 15 \\ &= 7{,}935 \end{aligned}$$

- An **area model** can be used to show these partial products. The sum of the areas equals the product. The model shows $2{,}645 \times 3$.

Notice that $2{,}645 = 2{,}000 + 600 + 40 + 5$. The value of each digit in 2,645 is multiplied by 3.



Each smaller rectangular area equals a partial product. The total area, or 6,000 + 1,800 + 120 + 15 = 7,935, is the product.

- The **standard algorithm** can also be used to find a product.

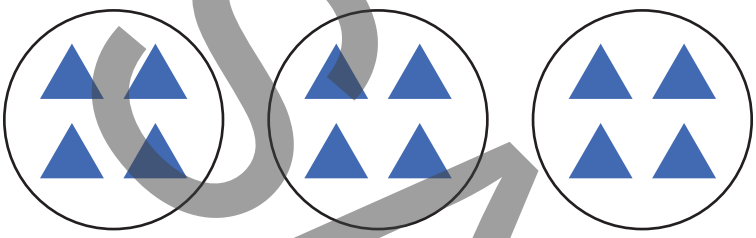
$$\begin{array}{r} {\scriptstyle 1\ 1\ 1} \\ 2,645 \\ \times \quad\ 3 \\ \hline 7,935 \end{array}$$

When multiplying by using the standard algorithm, if any product you get is larger than 9, you must regroup, as shown.

Guided Instruction

Multiplication is repeated addition.

For example, you can write the product of 3×4 as the sum $4 + 4 + 4$. Both operations show "3 groups of 4". Shown below are 3 groups of 4 triangles.



The total number of triangles is 12, so $3 \times 4 = 12$ and $4 + 4 + 4 = 12$.

On a multiplication table, products are shown where rows and columns meet. The product of 3×4, or 12, is highlighted in the table below.

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Circle the products for the multiplication facts.

$4 \times 6 =$ 16 20 24 28 32

$7 \times 5 =$ 20 25 30 35 40

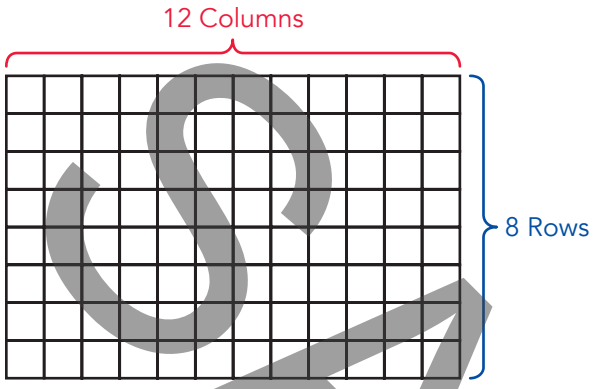
$6 \times 8 =$ 24 32 36 42 48

$9 \times 7 =$ 45 54 63 72 81

Check your answers using the multiplication table.

The multiplication fact 8 × 12 means 8 groups of 12. We can easily show this fact with an array or an area model.

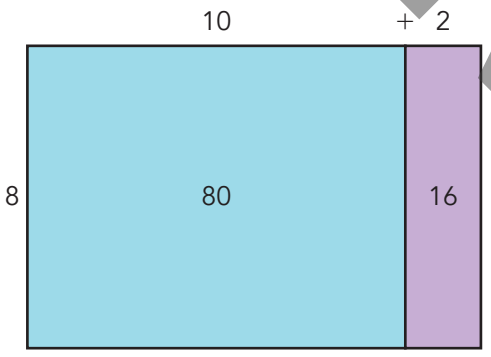
Array



To find the factors shown by the array, count the number of squares in each row and the number of rows.

This array has 8 rows and 12 columns. The total number of squares show the product.

Area model



Each area (or partial product) in the area model is calculated by multiplying the length times the width. The sum of the partial products equals the product.

The area model above represents:

8 × 12 = (8 × _____) + (8 × _____)

= _____ + 16

= _____

To multiply larger numbers, you must know your basic multiplication facts.

You can use partial products, an area model, or the standard algorithm to multiply a 4-digit number by a 1-digit number.

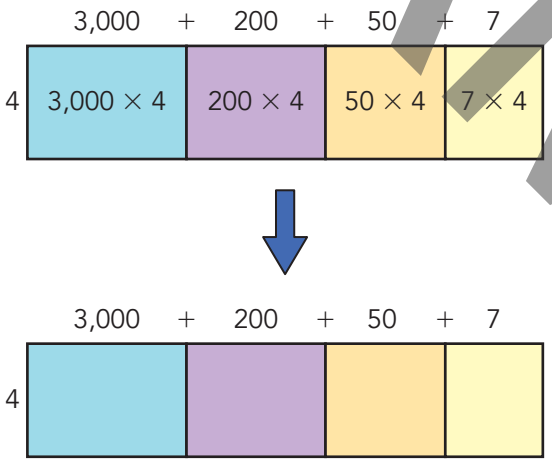
Multiply 3,257 × 4. You can break apart one or more factors by place value to find partial products that may be added to obtain a product.

3,257 × 4 = (3,000 × 4) + (_____ × 4) + (50 × 4) + (7 × 4)

= _____ + 800 + 200 + 28

= _____

You can show the same process by using an area model:



The total area, or 12,000 + 800 + 200 + 28, equals 13,028. So, the product of 3,257 × 4 = 13,028.

You may also use the standard to find the product:

$$\begin{array}{r} {\scriptstyle 1\ 2\ 2\ \ } \\ 3,257 \\ \times \quad\ 4 \\ \hline 13,028 \end{array}$$

You multiply 4 by each digit in 3,257. When you get a product that is larger than 9, regroup. For example, 28 is larger than 9, so you must put down the 8 and carry the 2 tens. When you multiply 4 by 5, do not forget to add the 2.

You can also use partial products, an area model, or the standard algorithm to multiply two 2-digit numbers.

Multiply 58 × 69.

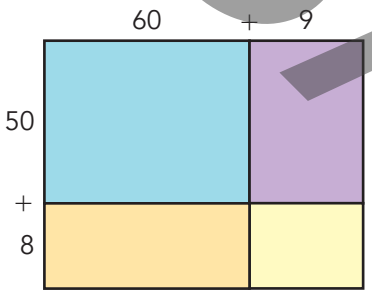
58 × 69 = (50 + 8) × (60 + 9)

= (50 × 60) + (_____ × 9) + (8 × 60) + (8 × 9)

= _____ + 450 + 480 + 72

= _____

You can show the same process by using an area model:



The total area, or 3,000 + 450 + 480 + 72, equals 4,002. So, the product of 58 × 69 = 4,002.

The standard algorithm may also be used to find the product:

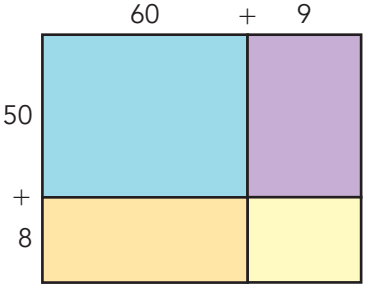
$$\begin{array}{r} {\scriptstyle 4}\,\not{5}\,8 \\ \times\ 6\ 9 \\ \hline \\ +\qquad 0 \\ \hline \end{array}$$

You first multiply 9 by each digit in 58. Follow the same rules for regrouping, as necessary. Next, write a 0 under the ones place of your first line. Now, multiply 6 by each digit in 58, regrouping when needed. Add the two lines to find the product.

Relate the standard algorithm subanswers to the area model subanswers.

In the area model, circle the subanswers that match to the blue parts in the standard algorithm.

In the area model, put a box around the subanswers that match to the red parts in the standard algorithm.



Independent Practice

Answer the questions that follow.

Practice 1

1 Which number has factors 5 and 80?

A 300

B 350

C 400

D 450

Your answer will be the product of 5 and 80.

2 What is the product?

9×800

A 6,300

B 7,200

C 8,100

D 9,000

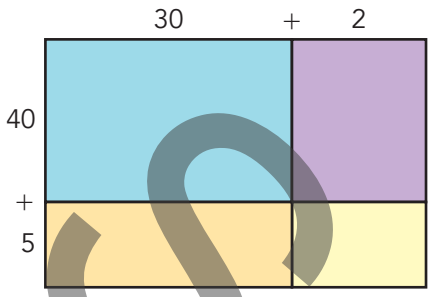
3 Multiply $4,265 \times 2$.

Fill in the blanks to show the first step of finding the partial products.

$4,265 \times 2 = (\_\_\_\_\_ \times 2) + (\_\_\_\_\_ \times 2) +$

$(\_\_\_\_\_ \times 2) + (\_\_\_\_\_ \times 2)$

4 Fill in the areas in the area model to show the partial products of 45 × 32.



Don't forget to find the area of each rectangle!

5 Giselle has 65 pages of stickers. There are 28 stickers on each page. How many stickers does she have in all?

A 650

B 1,680

C 1,720

D 1,820

Practice 2

1 What is the product?

2,225 × 6 = _____

2 John is asked to multiply 3,562 × 4. Which correctly shows the product as a sum of partial products?

A 12,000 + 200 + 240 + 8

B 12,000 + 2,000 + 240 + 8

C 1,200 + 2,000 + 240 + 8

D 12,000 + 2,200 + 120 + 8

3 A school principal purchases 45 books that each cost $22 for the school library. How much does the principal spend?

A $880

B $890

C $990

D $1,800

---

4 Hannah multiplies 83 times 34 by using the standard algorithm. Her work is shown below.

$$\begin{array}{r} 83 \\ \times\ 34 \\ \hline 322 \\ +\ 2,490 \\ \hline 2,812 \end{array}$$

Which statement is true?

A She forgot to carry a ten.

B She should not have placed a 0 in the second line.

C She did not add correctly.

D She did not make any mistake.

---

5 Which of the following shows the partial products you get when multiplying 67×84?

A $(60 \times 80) + (60 \times 4) + (7 \times 80) + (7 \times 4)$

B $(60 \times 8) + (60 \times 40) + (7 \times 8) + (7 \times 40)$

C $(6 \times 80) + (6 \times 4) + (70 \times 80) + (70 \times 4)$

D $(60 \times 80) + (60 \times 4) + (70 \times 80) + (70 \times 4)$

First, break apart each factor by place value.

Exit Ticket

With each flight, Matt earns 1,455 award miles. How many award miles will he have earned after 8 flights?

Complete the area model to represent and solve this problem.

	1,000	+	400	+	50	+	5
8							

_____ + _____ + _____ + _____ = _____

He will have earned _____ award miles after 8 flights.

Describe how the area model shows the solution to the problem.

_____

_____

_____

_____

_____

_____

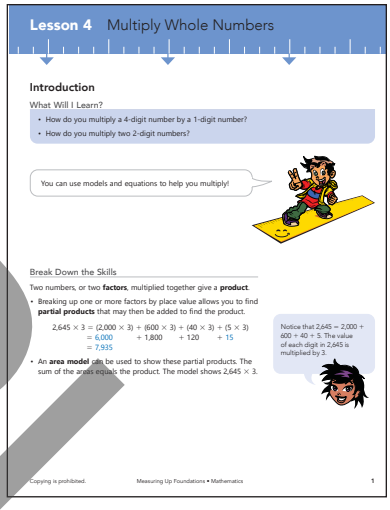
_____

TEACHER GUIDE

Lesson 4 Multiply Whole Numbers

At-a-Glance	
Learning Objectives	**Review Skills**
• Multiply a 4-digit number by a 1-digit number. • Multiply two 2-digit numbers.	• Know multiplication facts.
Academic Vocabulary	**Why Students May Struggle**
factor product partial product area model standard algorithm	Students might not understand how partial products relate to the total product. Students might not understand why the standard algorithm works.

WHAT WILL I LEARN?


Lesson 4 Multiply Whole Numbers

Introduction

What Will I Learn?

- How do you multiply a 4-digit number by a 1-digit number?
- How do you multiply two 2-digit numbers?

You can use models and equations to help you multiply!

Break Down the Skills

Two numbers, or two **factors**, multiplied together give a **product**.

- Breaking up one or more factors by place value allows you to find **partial products** that may then be added to find the product.

2,645 × 3 = (2,000 × 3) + (600 × 3) + (40 × 3) + (5 × 3)
= 6,000 + 1,800 + 120 + 15
= 7,935

Notice that 2,645 = 2,000 + 600 + 40 + 5. The value of each digit in 2,645 is multiplied by 3.

- An **area model** can be used to show these partial products. The sum of the areas equals the product. The model shows 2,645 × 3.

Copying is prohibited. Measuring Up Foundations • Mathematics 1

ACTIVATING PRIOR KNOWLEDGE

- Review the concept of multiplication with students. On the board, show examples of multiplicative situations. For example, show 4 sets of 3 birds, 5 groups of 10 pennies each, 6 muffin tins with 12 muffins each, and so on. Have students describe how they can represent each of these examples by using number sentences. For the group of birds, look for students to say that they can write 4 times 3 or show 3 plus 3 plus 3 plus 3. Ask students to explain why their number sentences are correct.
- Give students a hundred chart and ask them to choose three multiplication facts shown on the chart. Ask them to write and illustrate the three facts by using a drawing.
- Call out random multiplication facts and ask students to, as a group, provide the answers.

EXPLICIT INSTRUCTION

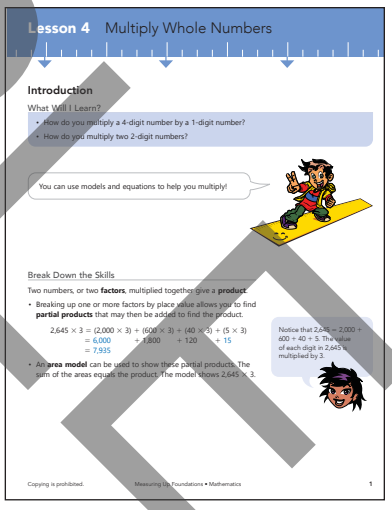
- Explain that several strategies may be used to multiply numbers. Clarify that both the partial products method and the area model method show multiplication visually, and that the standard algorithm method provides an efficient way to multiply. Tell students that by learning all three methods, they will know which works best for them.
- On the board, write the problem 1,234 × 5. Ask students to discuss ways that this problem could be represented by using models and drawings. Students may say that they can draw 1,234 groups of 5 pencils each or draw a rectangle with 1,234 rows and 5 columns. Draw the models suggested by students on the board and have students discuss how they are similar and different.

- Give students some base-ten blocks. Ask them to represent the number 1,234 by using the blocks. Ask students if they can describe the number by place value. Confirm students' understanding and write 1,234 = 1,000 + 200 + 30 + 4 on the board.
- Explain that the number 1,234 can be multiplied by 5 by multiplying each digit's value by 5. Point to the multiplication problem again. Then, write 1,234 × 5 = (1,000 × 5) + (200 × 5) + (30 × 5) + (4 × 5). Ask students to help you perform the operations inside the parentheses and simplify. Use the same idea of partial products to show how this work can be represented by using an area model.
- Point out to students that they are using the distributive property when they separate the place values and multiply. Remind them that the distributive property of multiplication says that 10 × 25 is the same as 10 × 20 + 10 × 5.
- Ask students to multiply 2,674 × 2. Arrange students in groups of three. Have one student solve the problem by using partial products and an equation. Have another student solve the problem by using an area model. Have the third student solve the problem by using the standard algorithm. Ask students to compare the products that they got and discuss how partial products are represented in each model. Then, have group members switch strategies and use the same approaches to solve 24 × 28.
- Model the use of the standard algorithm to find the product. Ask students to discuss which method is easiest for them.
- Repeat the process, using the problem 36 × 24. Have students discuss how the processes for multiplying a 4-digit number by a 1-digit number and multiplying two 2-digit numbers are similar and different. Ask students if they know why they get two rows of numbers to add when multiplying two 2-digit numbers.

BREAK DOWN THE SKILLS

TEACH ACADEMIC VOCABULARY

- Explain that any numbers multiplied together are known as **factors** and that the answer that you get is known as the **product**. Tell students that when multiplying 2 times 3, 2 and 3 are both factors, and the answer they get, or 6, is the product.
- Review place value with students. Write the number 2,645 into a place-value chart on the board. Tell students that this number has 2 thousands, 6 hundreds, 4 tens, and 5 ones, so the number can be represented as a sum of the values of its digits. Then, write the following on the board: 2,645 = 2,000 + 600 + 40 + 5.


Lesson 4 Multiply Whole Numbers

Introduction

What Will I Learn?

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- How do you multiply two 2-digit numbers?

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Break Down the Skills

Two numbers, or two **factors**, multiplied together give a **product**.

- Breaking up one or more factors by place value allows you to find **partial products** that may then be added to find the product.

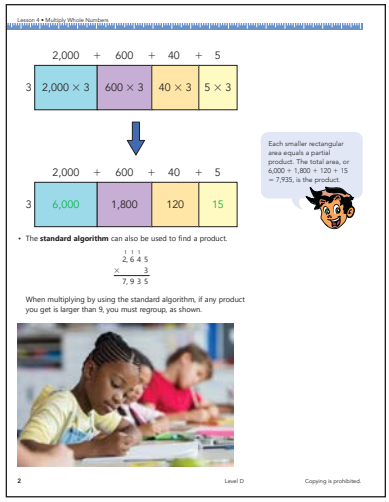
2,645 × 3 = (2,000 × 3) + (600 × 3) + (40 × 5) + (5 × 3)
= 6,000 + 1,800 + 120 + 15
= 7,935

- An **area model** can be used to show these partial products. The sum of the areas equals the product. The model shows 2,645 × 3.

Notice that 2,645 = 2,000 + 600 + 40 + 5. The value of each digit in 2,645 is multiplied by 3.

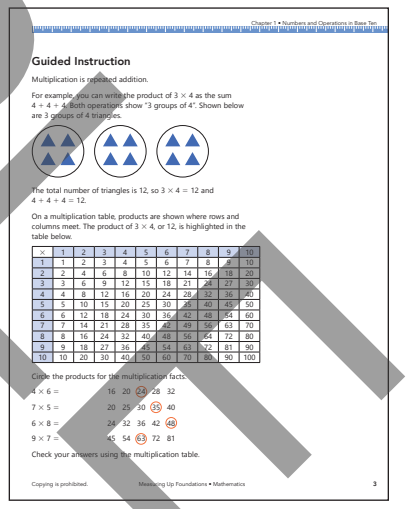
Copying is prohibited. Measuring Up: Foundations • Mathematics 1

- Explain that **partial products** are simply parts of the total product. Tell students that, when breaking up a factor by place value, you can multiply each digit's value by the other factor. Tell them that the product you get is called a *partial product*. Then, you add the partial products to get the total product."
  - Ask students to look at the problem 2,645 × 3 and fill in the missing partial products and the product.



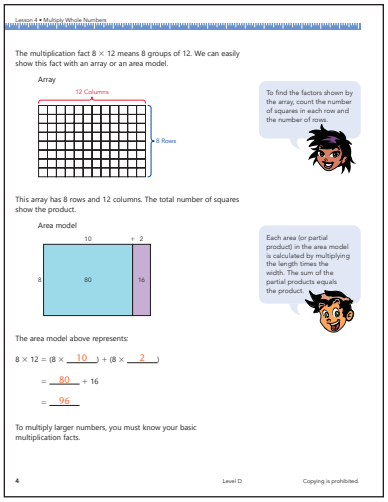
- Review the concept of area with students. Explain that any area can be divided into smaller areas. Ask students to tell you what they know about the sum of these smaller areas. Explain that an **area model** can be used to represent smaller areas of a total area, just like it can be used to represent partial products of a total product.
  - Ask students to look at the area model shown and use their understanding of partial products and area models to complete the second part of the model. Point out that the smaller areas in the second part of the model directly align with the smaller areas in the first part of the model shown above. So, for example, 1,800 is the partial product for the area represented by 600 × 3.
- Explain that the **standard algorithm** for multiplying numbers is a shortcut method used to find a product. With your pen, show that the 3 is multiplied by each digit in 2,645. Point out the cases of regrouping and the need to add the number that is carried after calculating a product.

GUIDED INSTRUCTION



- Have students look at the expressions 3 × 4 and 4 + 4 + 4, the words *3 groups of 4*, and the illustration of 3 groups of 4 triangles. Ask them to describe how the different representations are similar. Students may say that they each represent groups, with the same number in each group, that they each show 4, added 3 times, or that each representation shows a total of 12.
- Point to the multiplication table and use your pen to show how the row for 3 and the column for 4 intersect at the value 12. Explain that any product from 1 to 100 can be found with this table by finding the intersection of the factors, represented by a row and a column. Have students use their knowledge of the multiplication facts to circle the products for the four multiplication problems given below the multiplication table. Then have them use the multiplication table to check their answers.

Common Errors
Some students may use the wrong row and/or column when finding a product by using the multiplication table. Suggest that students use a paper edges or rulers to stay on the correct row and column.


Lesson 4 • Multiply Whole Numbers

The multiplication fact 8 × 12 means 8 groups of 12. We can easily show this fact with an array or an area model.

Array

12 Columns

8 Rows

To find the factors shown by the array, count the number of squares in each row and the number of rows.

This array has 8 rows and 12 columns. The total number of squares show the product.

Area model

10 + 2

8 | 80 | 16

Each area (or partial product) in the area model is calculated by multiplying the length times the width. The sum of the partial products equals the product.

The area model above represents:

8 × 12 = (8 × 10) + (8 × 2)

= 80 + 16

= 96

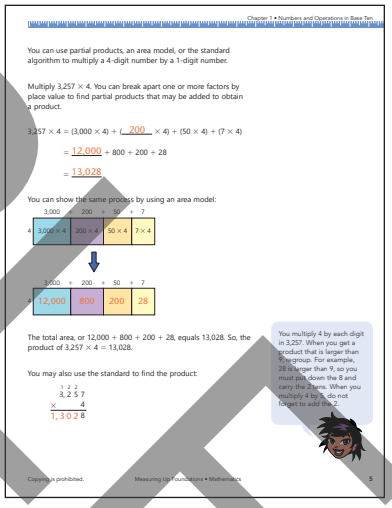
To multiply larger numbers, you must know your basic multiplication facts.

4 Level D Copying is prohibited.

- Move on to modeling the problem 8 ×12 by using an array, an area model, and an equation. Explain that although they may know the product of 8 × 12, it can be easily represented by using an array or an area model.
- Review the concept of an array, explaining that it represents groups of objects arranged in a rectangle. The length and width of an array represent the factors in a multiplication problem, and the total number of objects represents the product. Describe how the array represents the product 96.
- Point to the area model. Explain that the factor 12 has been broken up by place value as 10 + 2, so that sum appears along the top of the model. The other factor, 8, appears along the left side. The total area of the rectangle has been divided into two smaller areas, one with an area equal to 8 × 10, or 80, and the other with an area equal to 8 × 2, or 16. The sum of 80 + 16 = 96, so the area model also shows the product 96.
- Have students fill in the blanks to complete the equation that shows the same process for multiplying using partial products.

Common Errors

Some students may add 8 plus 10 and 8 plus 2 instead of multiplying 8 times 10 and 8 times 2. Remind students that area is calculated as length times width.


Chapter 1 • Numbers and Operations in Base Ten

You can use partial products, an area model, or the standard algorithm to multiply a 4-digit number by a 1-digit number.

Multiply 3,257 × 4. You can break apart one or more factors by place value to find partial products that may be added to obtain a product.

3,257 × 4 = (3,000 × 4) + (200 × 4) + (50 × 4) + (7 × 4)

= 12,000 + 800 + 200 + 28

= 13,028

You can show the same process by using an area model:

3,000 + 200 + 50 + 7

4 | 3,000 × 4 | 200 × 4 | 50 × 4 | 7 × 4

3,000 + 200 + 50 + 7

4 | 12,000 | 800 | 200 | 28

The total area, or 12,000 + 800 + 200 + 28, equals 13,028. So, the product of 3,257 × 4 = 13,028.

You may also use the standard to find the product:

3,257 × 4 = 13,028

You multiply 4 by each digit in 3,257. When you get a product that is larger than 9 regroup. For example, 28 is larger than 9, so you must put down the 8 and carry the 2 tens. When you multiply 4 by 3, do not forget to add the 2.

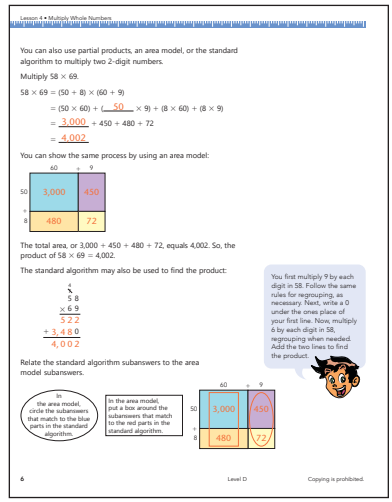
Copying is prohibited. Measuring the Foundations • Mathematics 5

- Introduce the 4-digit by 1-digit multiplication problem 3,257 × 4.
- Have students fill in the blanks to complete the equation that shows the process for multiplying, using partial products. Remind them that the factor 3,527 has been broken up by place value, so it has been broken up as the sum of the values of its digits.
- Have students use their understanding of the previous area model to complete the area model for 3,257 × 4. Make sure that students understand that each smaller area in the second part of the model directly matches the smaller area in the first part of the model above. Clarify that the first missing smaller area equals the product 3,000 × 4.
- Have students compare the answers from the equation and area model to make sure that the products are the same.
- Finally, provide a step-by-step explanation of how to solve by using the standard algorithm. Guide students to discover that with the standard algorithm, the partial products are continuously added to give the product. So, as you go to the next step of multiplying, you are adding the result to the previous step. Be sure that students understand that any product larger than 9 will not fit in a spot and must be regrouped. Also, be sure that students realize that the number carried must be added when finding each product. Have students finish the problem and then compare this product to the products found by using the previous two approaches.

Common Errors

Some students may incorrectly multiply when multiplying 4 by a multiple of 10. Have students first find the product of 4 and the non-zero digit of the other factor and then count the number of zeros in that other factor and add them to the end of the product. For example, when multiplying 50 × 4, they should first multiply 5 × 4 and then add a 0 to get the product 200.

- Introduce the 2-digit by 2-digit multiplication problem 58 × 69.
  - Have students fill in the blanks to complete the equation that shows the process for multiplying, using partial products. Remind them that the factors 58 and 69 have been broken up by place value, so each factor has been broken up as the sum of the values of its digits.


Lesson 4 • Multiply Whole Numbers

You can also use partial products, an area model, or the standard algorithm to multiply two 2-digit numbers.

Multiply 58 × 69.

58 × 69 = (50 + 8) × (60 + 9)

= (50 × 60) + (50 × 9) + (8 × 60) + (8 × 9)

= 3,000 + 450 + 480 + 72

= 4,002

You can show the same process by using an area model:

	60	+ 9
50	3,000	450
8	480	72

The total area, or 3,000 + 450 + 480 + 72, equals 4,002. So, the product of 58 × 69 = 4,002.

The standard algorithm may also be used to find the product:

$$\begin{array}{r} {}^{4}\\ 58\\ \times\ 69\\ \hline 522\\ +\ 3,480\\ \hline 4,002 \end{array}$$

You first multiply 9 by each digit in 58. Follow the same rules for regrouping, as necessary. Next, write a 0 under the ones place of your first line. Now, multiply 6 by each digit in 58, regrouping when needed. Add the two lines to find the product.

Relate the standard algorithm subanswers to the area model subanswers.

In the area model, circle the subanswers that match to the blue parts in the standard algorithm.

In the area model, put a box around the subanswers that match to the red parts in the standard algorithm.

	60	+ 9
50	3,000	450
+		
8	480	72

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- Have students use their understanding of finding partial products by using an area model to complete the area model for 58 × 69. Make sure that students understand the dimensions of each smaller rectangle. For example, the smaller rectangle on the top row of the model has dimensions of 50 and 9, so the area, or partial product, is calculated as 50 × 9.
- Have students compare the answers from the equation and area model to make sure that the products are the same.
- Finally, provide a step-by-step explanation of how to solve using the standard algorithm. Be sure that students notice that with multiplication of 2-digit numbers, they will get two rows of partial products that need to be added. Point out the 0 placeholder and ask students to explain why they think that it is necessary.
- Have students compare the rows from the standard algorithm output to the areas in the area model. Facilitate a discussion to guide students to discover that the rows represent the partial products for the sum of 9 times 50 and 9 times 8 and the sum of 60 times 50 and 60 times 8. Have students circle and put a box around the subanswers as directed.

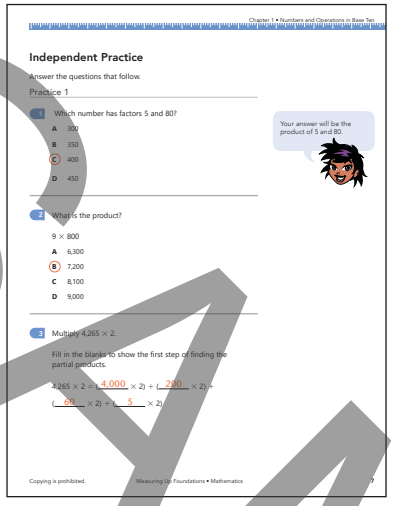
Common Errors

Students may multiply the wrong numbers when using the area model. You might have students cover the other parts of the area model with paper so that they may focus only on one smaller area at a time.

INDEPENDENT PRACTICE

Practice 1 Questions

- Read the questions aloud and have students select or provide the answers. Review the answers.



Independent Practice

Answer the questions that follow.

Practice 1

1 Which number has factors 5 and 80?

A 300
B 350
C 400
D 450

Your answer will be the product of 5 and 80.

2 What is the product?

9 × 800

A 6,300
B 7,200
C 8,100
D 9,000

3 Multiply 4,265 × 2.

Fill in the blanks to show the first step of finding the partial products.

4,265 × 2 = (4,000 × 2) + (200 × 2) + (60 × 2) + (5 × 2)

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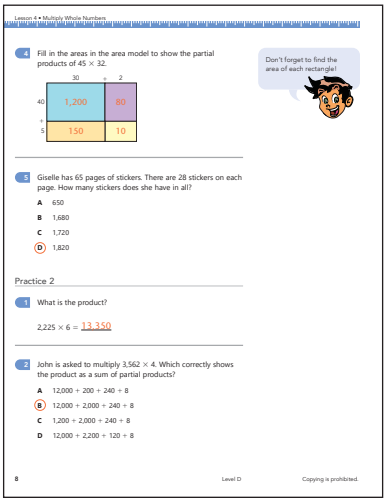

4 Fill in the areas in the area model to show the partial products of 45 × 32.

	30	+	2
40	1,200		80
+			
5	150		10

Don't forget to find the area of each rectangle!

5 Giselle has 65 pages of stickers. There are 28 stickers on each page. How many stickers does she have in all?

A 650
B 1,680
C 1,720
D 1,820

Practice 2

1 What is the product?

2,225 × 6 = 13,350

2 John is asked to multiply 3,562 × 4. Which correctly shows the product as a sum of partial products?

A 12,000 + 200 + 240 + 8
B 12,000 + 2,000 + 240 + 8
C 1,200 + 2,000 + 240 + 8
D 12,000 + 2,200 + 120 + 8

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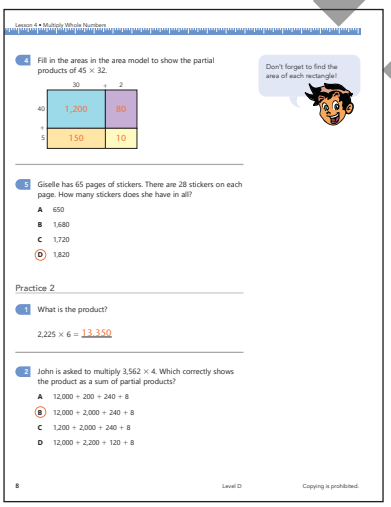
Practice 2 Questions

- Ask students to read the questions and select or provide the answers independently. Review the answers.



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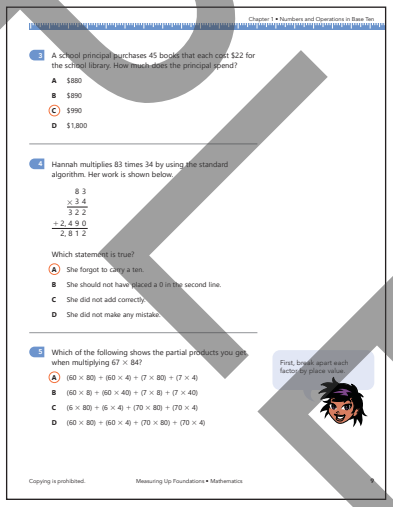

3 A school principal purchases 45 books that each cost $22 for the school library. How much does the principal spend?

A $880
B $890
C $990
D $1,800

4 Hannah multiplies 83 times 34 by using the standard algorithm. Her work is shown below.

$$\begin{array}{r} 83 \\ \times\ 34 \\ \hline 322 \\ +\ 2,490 \\ \hline 2,812 \end{array}$$

Which statement is true?

A She forgot to carry a ten.
B She should not have placed a 0 in the second line.
C She did not add correctly.
D She did not make any mistake.

5 Which of the following shows the partial products you get when multiplying 67 × 84?

A (60 × 80) + (60 × 4) + (7 × 80) + (7 × 4)
B (60 × 8) + (60 × 40) + (7 × 8) + (7 × 40)
C (6 × 80) + (6 × 4) + (70 × 80) + (70 × 4)
D (60 × 80) + (60 × 4) + (70 × 80) + (70 × 4)

First, break apart each factor by place value.

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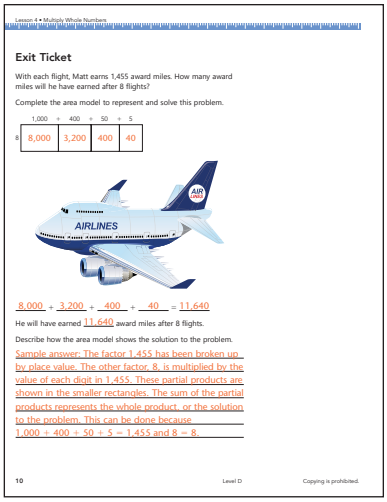
EXIT TICKET

- Have students fill in the Exit Ticket at the end of class. Make sure that students understand that they are supposed to fill in each smaller area on the area model as well as the blanks that follow the model.



Lesson 4 • Multiply Whole Numbers

Exit Ticket

With each flight, Matt earns 1,455 award miles. How many award miles will he have earned after 8 flights?

Complete the area model to represent and solve this problem.

8	1,000	+	400	+	50	+	5
	8,000		3,200		400		40

8,000 + 3,200 + 400 + 40 = 11,640

He will have earned 11,640 award miles after 8 flights.

Describe how the area model shows the solution to the problem.

Sample answer: The factor 1,455 has been broken up by place value. The other factor, 8, is multiplied by the value of each digit in 1,455. These partial products are shown in the smaller rectangles. The sum of the partial products represents the whole product, or the solution to the problem. This can be done because 1,000 + 400 + 50 + 5 = 1,455 and 8 = 8.

10 Level D Copying is prohibited.

ADDITIONAL SUPPORT

SUPPORT FOR STRUGGLING LEARNERS

- For students who are struggling to understand how to break apart factors by place value to obtain partial products, have them first show the factor(s) as the sum of the values of its digits before completing an equation to show the partial products and total product. Use Copy Master 1 and Copy Master 2 at the end of these teacher notes. For each copy master, make a copy of the master and insert starting problems for each outline. By providing different starting problems, the activities can be completed over and over and be different activities each time.
- Have struggling students practice multiplying whole numbers by using the lattice method.

SUPPORT FOR ENGLISH LANGUAGE LEARNERS

- Some English language learners may struggle to understand the meaning of the word *factor*. Ask students to describe the meaning, using their own words. Students may tell you that a factor is something that matters or that it has a role in determining something. As you go through each multiplication problem, point to each number in the problem and tell students that the number is called a *factor* because it has a role in determining the answer.
- Some English language learners may struggle to understand the meaning of the word *product*. Ask students to describe the meaning in their own words. Students may say that a product is the outcome or that it is the result of something. As you go through each multiplication problem, point to each answer and tell students that the number is called the *product* because it is the result of multiplying some numbers.

EXTENSION ACTIVITIES

- Have students work in groups of three. Have the whole group work together to create a worksheet that has four multiplication problems—two 4-digit by 1-digit problems and two 2-digit by 2-digit problems. Have each group member take on a strategy for solving (using an equation and partial products, using an area model, or using the standard algorithm for multiplication). When all students have found the answers, have students compare answers and discuss what they learned.

- Have students work with a partner to create four multiplication word problems. Have students solve each problem by using each approach.
- Have students work in groups to create a presentation on what they learned about multiplying 4-digit by 1-digit numbers and multiplying two 2-digit numbers. The presentation should include one sample problem for each and clearly illustrate an understanding of using multiple approaches for representing and solving the problems.

Name _____ **Date** _____

Multiply a 4-Digit Number by a 1-Digit Number

Multiplication Problem:

____ × ____

Break Apart Larger Factor by Place Value:

____ = ____ + ____ + ____ + ____

Find Partial Products:

____ × ____ = (____ × ____) + (____ × ____) + (____ × ____) + (____ × ____)

= ____ + ____+ ____ + ____

= ____

Multiplication Problem:

____ × ____

Break Apart Larger Factor by Place Value:

____ = ____ + ____ + ____ + ____

Find Partial Products:

____ × ____ = (____ × ____) + (____ × ____) + (____ × ____) + (____ × ____)

= ____ + ____+ ____ + ____

= ____

Name _____ **Date** _____

Multiply a 2-Digit Number by a 2-Digit Number

Multiplication Problem:

____ × ____

Break Apart Both Factors by Place Value:

____ = ____ +____

____ = ____ + ____

Find Partial Products:

____ × ____ = (____ × ____) + (____ × ____) + (____ × ____) + (____ × ____)

= ____ + ____ + ____ + ____

= ____

Multiplication Problem:

____ × ____

Break Apart Both Factors by Place Value:

____ = ____ +____

____ = ____ + ____

Find Partial Products:

____ × ____ = (____ × ____) + (____ × ____) + (____ × ____) + (____ × ____)

= ____ + ____ + ____ + ____

= ____