

Multidigit Multiplication

In Unit 4 your child will multiply multidigit numbers using **extended multiplication facts**, **partial-products multiplication**, and **lattice multiplication**. Throughout the unit, students use these methods to solve real-life multistep multiplication number stories.

The unit begins with extended multiplication facts. Knowing that $5 * 3 = 15$ helps students see that $50 * 3 = 150$; $500 * 3 = 1,500$; and so on. Working with extended facts gives students the ability to multiply larger numbers with ease.

Students also learn the partial-products multiplication method in which the value of each digit in one factor is multiplied by the value of each digit in the other factor. They partition a rectangle into smaller parts to help them understand how the method works. The example below shows how to use partial-products multiplication to find $456 * 4$.

Partitioned Rectangles	Partial-Products Multiplication															
$400 + 50 + 6$ <div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;">4</div> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 30%; height: 40px;">1600</td> <td style="width: 20%; height: 40px;">200</td> <td style="width: 10%; height: 40px;">24</td> </tr> </table> </div> 456	1600	200	24	<table style="margin-left: auto; margin-right: auto;"> <tr><td></td><td style="text-align: right;">4 5 6</td></tr> <tr><td></td><td style="text-align: right;">* 4</td></tr> <tr><td style="text-align: right;">4 * 400 →</td><td style="text-align: right;">1 6 0 0</td></tr> <tr><td style="text-align: right;">4 * 50 →</td><td style="text-align: right;">2 0 0</td></tr> <tr><td style="text-align: right;">4 * 6 →</td><td style="text-align: right;">+ 2 4</td></tr> <tr><td></td><td style="text-align: right; border-top: 1px solid black;">1, 8 2 4</td></tr> </table>		4 5 6		* 4	4 * 400 →	1 6 0 0	4 * 50 →	2 0 0	4 * 6 →	+ 2 4		1, 8 2 4
1600	200	24														
	4 5 6															
	* 4															
4 * 400 →	1 6 0 0															
4 * 50 →	2 0 0															
4 * 6 →	+ 2 4															
	1, 8 2 4															

To practice multiplying 2-digit numbers using partial-products multiplication, students play a game called *Multiplication Wrestling*.

Finally, students are introduced to the lattice multiplication method: The lattice method breaks down the numbers into place values, allowing students to work with smaller numbers while solving a multidigit multiplication problem. It is an efficient method, often taking no more time than other methods.

7 9	← factor
× 4	← factor
3 1 6	

	7	9	
3	2	3	4
	8	6	
	1	6	

(7 × 4) (9 × 4)

In this unit, students apply their understanding of multidigit multiplication to solve conversion problems involving liters and milliliters and grams and kilograms. They also find the area of rectilinear figures.

Please keep this Family Letter for reference as your child works through Unit 4.

Vocabulary

Important terms in Unit 4:

adjacent Next to, or adjoining.

decompose To “break apart” numbers into friendlier numbers.

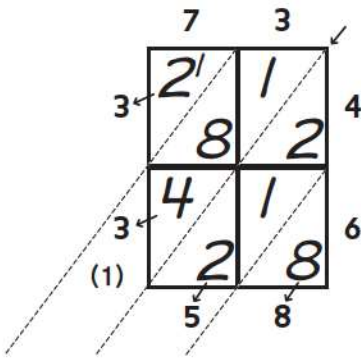
Distributive Property A rule saying that if a , b , and c are real numbers, then:
 $a * (b + c) = (a * b) + (a * c)$.

extended multiplication facts Multiplication facts involving multiples of 10, 100, and so on. For example, $400 * 6 = 2,400$ and $20 * 30 = 600$ are extended multiplication facts.

gram (g) A unit of mass in the metric system. There are about 454 grams in 1 pound.

kilogram (kg) 1,000 grams.

lattice multiplication A way to multiply multidigit numbers. *For example:*



liter (L) A unit of capacity in the metric system. It is equivalent to a little more than one quart.

mass The measure of the amount of matter in an object.

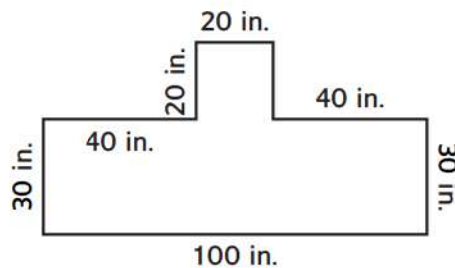
milliliter (mL) $\frac{1}{1000}$ of a liter.

partial-products multiplication A way to multiply in which the value of each digit in one factor is multiplied by the value of each digit in the other factor. The final product is the sum of the partial products. *For example:*

$$\begin{array}{r}
 73 \\
 * 46 \\
 \hline
 40 * 70 \rightarrow 2800 \\
 40 * 3 \rightarrow 120 \\
 6 * 70 \rightarrow 420 \\
 6 * 3 \rightarrow 18 \\
 \hline
 3,358
 \end{array}$$

partition (in partial-products multiplication) A technique that uses the Distributive Property to break up a large rectangle into smaller rectangles in order to find the area more easily in parts.

rectilinear figure A single figure formed by combining multiple adjacent rectangles.



Do-Anytime Activities

To work with your child on concepts taught in this unit, try these activities:

1. Practice extended multiplication facts such as $50 * 40 = \underline{\quad}$.
2. Collect three to five cans and bottles from the kitchen. Put them on the table and ask your child to order them, without looking at the labels, based on the amount of liquid each container can hold and/or their mass. Ask your child to estimate both. Check the results together by looking at the labels.
3. Pose a multiplication problem and ask your child to solve it using a method of his or her choice. Have your child explain to you or someone else at home what he or she did to complete the problem.

Building Skills through Games

In this unit your child will play the following game to develop his or her understanding of multiplication. For detailed instructions, see the *Student Reference Book*.

Multiplication Wrestling See *Student Reference Book*, page 267.

The game provides practice with multiplication of 2-digit numbers by 2-digit numbers.

As You Help Your Child with Homework

As your child brings assignments home, you may want to go over instructions together, clarifying them as necessary. The answers listed below will guide you through the Home Links for this unit.

Home Link 4-1

- 560; 3,200; 630; 3,600
- 450; 200; 63,000; 28,000
- 9; 240; 700; 6,300
- Answers vary. 9. 1,190
- 13,303

Home Link 4-2

Number models are sample answers.

- $(20 * 30) - (10 * 30) = 300$;
330; Answers vary.
- $30 * 50 = 1,500$; $30 * 40 = 1,200$; $1,500 - 1,200 = 300$; 496; Answers vary.
- 1,410,000

Home Link 4-3

- 140; Sample answer:

4	120	20	+	20	=	140
	30	5				
	35					

- 441; Sample answer:

9	360	81	+	81	=	441
	40	9				
	49					

- 2,956
- 2,559

Home Link 4-4

- 8,000; 15,000; 20,000; 25,000
- 122,000 mL 5. 14,445 7. 62,341

Home Link 4-5

- Sample answer: Four calculators fit in a layer. The box is 5 cm tall, so there are 5 layers of calculators. The box fits 4 calculators * 5, which is 20 calculators in all.
- 108
- 129

Home Link 4-6

- | | | | |
|---|------|---|-----|
| * | 48 | = | 144 |
| | 3 | | |
| | 120 | | |
| | + 24 | | |
| | 144 | | |
- 9 [100,000s] + 5 [1,000s] + 6 [100s] + 3 [1s]

Unit 4: Family Letter, continued

5. $2 [1,000,000s] + 5 [100,000s] + 9 [10,000s] + 9 [1,000s] + 2 [1s]$

Home Link 4-7

1. 25; 50,000; 75,000; 100
 3. 237,000; 98,000; 485; 920,000
 5. 63,000 grams 7. 396 9. 294

Home Link 4-8

1. \$478 3. \$55
 5. 1, 3, 7, 21 7. 1, 2, 3, 4, 6, 9, 12, 18, 36

Home Link 4-9

1. 1,748

$$\begin{array}{r} 46 \\ * 38 \\ \hline 1200 \\ 180 \\ 320 \\ + 48 \\ \hline 1,748 \end{array}$$

3. $65 * 22 = t$; 1,430 trees
 5. 185 7. 1,992

Home Link 4-10

1. 42; 420; 420; 4,200; 4,200; 42,000
 3. 32; 320; 320; 3,200; 3,200; 32,000
 5. 6; 6; 60; 9; 900; 9,000
 7. 2,139 9. 32,632

Home Link 4-11

1. $18 * 27 = 486$; 486 square units
 3. Sample answer: $100 * 30 = 3,000$;
 $20 * 20 = 400$; $3,000 + 400 = 3,400$;
 3,400 square inches
 5. 1, 2, 31, 62 7. 1, 5, 11, 55

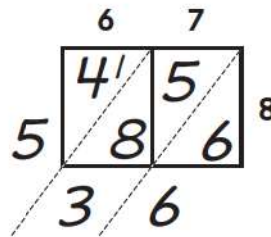
Home Link 4-12

Sample number models:

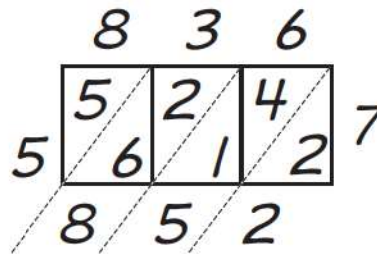
1. $(10 * 7) * 2 = 140$; $(5 * 7) * 2 = 70$;
 $140 + 70 = 210$ stickers;
 $(8 * 7) * 2 = x$; $(5 * 7) * 2 = y$;
 $112 + 70 = s$; 182 stickers
 3. 1 and 50, 2 and 25, 5 and 10
 5. 1 and 85, 5 and 17

Home Link 4-13

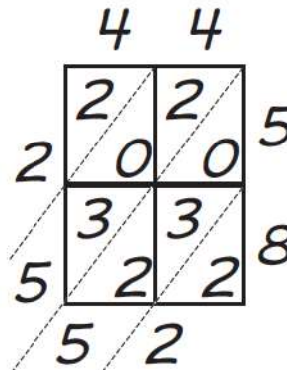
1. 536



2. 5,852



4. 2,552



6. 616 8. 356