Multiply by One-Digit Numbers

Dear Family,

This week your child is learning to multiply two-, three-, and four-digit numbers by one-digit numbers.

Your child is learning to multiply a greater number by a one-digit number, such as 324×9.

One way to multiply is to use **partial products**. With this strategy, you multiply each digit in 324 by 9, taking into account the place value of each digit.

The first step is to write the multiplication vertically. Next, find the individual partial products. Then add the partial products together to find the total product of the multiplication.

$$
\begin{array}{r}
324 \\
\times \quad 9 \\
\hline
36 \quad \longrightarrow \quad 9 \times 4 \text{ ones} \\
180 \quad \longrightarrow \quad 9 \times 2 \text{ tens} \\
+ \ 2{,}700 \quad \longrightarrow \quad 9 \times 3 \text{ hundreds} \\
\hline
2{,}916
\end{array}
$$

So, $324 \times 9 = 2{,}916$.

Invite your child to share what he or she knows about multiplying by one-digit numbers by doing the following activity together.

ACTIVITY MULTIPLYING BY ONE-DIGIT NUMBERS

Do this activity with your child to multiply a three-digit number by a one-digit number.

An adult elephant can eat between 200 and 600 pounds of food each day. Multiplication is a good way to find how much an elephant can eat over several days.

- Have your child choose a number between 200 and 600. Suppose this number is the number of pounds of food an elephant eats in one day. For example, your child might choose 532.

- Have your child use this number to find out how much the elephant eats in a week (7 days).

- Have your child multiply to find the answer.

$$
\begin{array}{r}
532 \\
\times \quad 7 \\
\hline
14 \\
210 \\
+\ 3,500 \\
\hline
3,724
\end{array}
$$

$14 \longrightarrow 7 \times 2$
$210 \longrightarrow 7 \times 30$
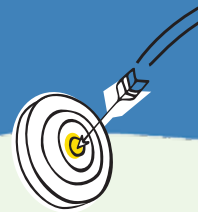$3,500 \longrightarrow 7 \times 500$

So, the elephant eats 3,724 pounds of food in one week!

- Switch roles and repeat the activity.

Look for real-life opportunities to multiply two-, three-, and four-digit numbers by one-digit numbers with your child.

Explore Multiplying by One-Digit Numbers

You have learned how to break apart numbers to multiply and how to multiply one-digit numbers by multiples of ten. Use what you know to try to solve the problem below.

What is the product of 3 and 57?

TRY IT

Math Toolkit
- base-ten blocks
- counters
- bowls
- grid paper
- sticky notes
- number lines
- multiplication models

DISCUSS IT

Ask your partner: How did you get started?

Tell your partner: I started by . . .

CONNECT IT

1 LOOK BACK

Explain how you found the product of 3 and 57.

2 LOOK AHEAD

You can use arrays, area models, and **partial products** to break apart numbers to help you multiply. The array at the right uses base-ten blocks to show 3×157.

a. Write 157 in expanded form. ....

b. Fill in the blanks below to show how to find 3×157.

$3 \times 157 = (3 \times \text{.......}) + (3 \times \text{.......}) + (3 \times \text{.......})$

$= \text{.......} + \text{.......} + \text{.......}$

$= \text{.......}$

c. What do you notice about the number of zeros in the product of 3 and 50 and in the product of 3 and 100? How many zeros would be in the product of $3 \times 1,000$? Explain.

100   +   50   +   7

3
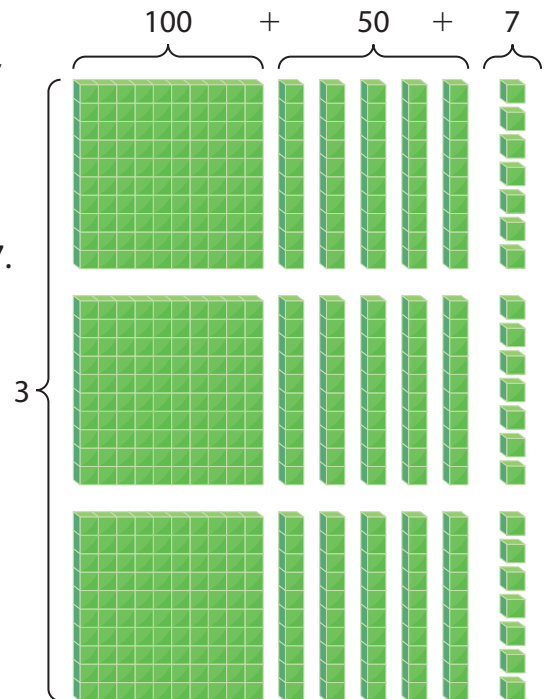
3 REFLECT

How does breaking apart the multiplication problem above by place value help you solve the problem?

....

....

....

Prepare for Multiplying by One-Digit Numbers

1 Think about what you know about multiplication. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

What Is It?	What I Know About It

product

Examples	Examples	Examples

2 Fill in the blanks below to show how to find 2×48.

$2 \times 48 = (2 \times \text{_____}) + (2 \times \text{_____})$

$ = \text{_____} + \text{_____}$

$ = \text{_____}$

40   8

2
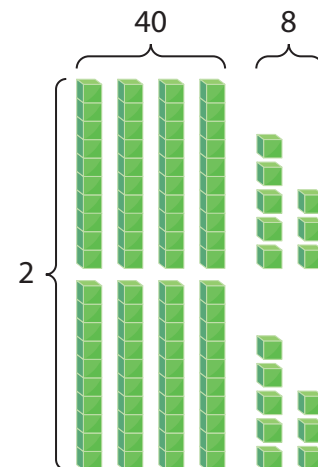
3 Solve the problem. Show your work.

What is the product of 4 and 62?

Solution ....

4 Check your answer. Show your work.

Develop Multiplying a Three-Digit Number by a One-Digit Number

Read and try to solve the problem below.

What is the product of 3 and 254?

TRY IT

Math Toolkit
- base-ten blocks ▶
- grid paper
- index cards
- sticky notes
- number lines ▶
- multiplication models ▶

DISCUSS IT

Ask your partner: Can you explain that again?

Tell your partner: I agree with you about . . . because . . .

Explore different ways to understand multiplying a three-digit number by a one-digit number.

What is the product of 3 and 254?

MODEL IT

You can use an array of base-ten blocks to help you multiply.

254

254

254

6 hundreds　　**15 tens**　**12 ones**
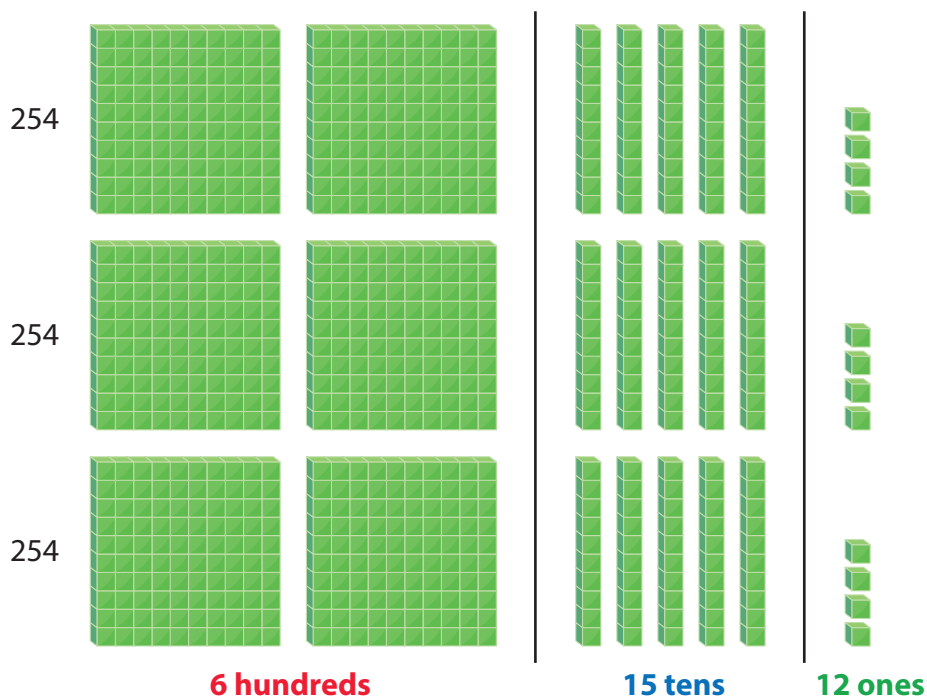
$3 \times 254 = \mathbf{600} + \mathbf{150} + \mathbf{12}$

MODEL IT

You can also multiply using partial products.

$$
\begin{array}{r}
254 \\
\times \quad 3 \\
\hline
\mathbf{12} \longrightarrow 3 \times 4 \text{ ones} \\
\mathbf{150} \longrightarrow 3 \times 5 \text{ tens} \\
+ \ \mathbf{600} \longrightarrow 3 \times 2 \text{ hundreds} \\
\hline
?
\end{array}
$$

The partial products are **12**, **150**, and **600**.
The product is the sum of the partial products: **12** + **150** + **600**.

CONNECT IT

Now you will use the problem from the previous page to help you understand how to multiply three-digit numbers by one-digit numbers.

1 In the first **Model It**, what do the numbers 600, 150, and 12 in the equation below the array represent?

2 How can you find the product of 3 and 254 in the first **Model It**?

3 Where do you see the 6 hundreds, 15 tens, and 12 ones in the second **Model It**?

4 What is the sum of the partial products in the second **Model It**? ....

5 How can you use estimation to check that your answer is reasonable?

6 How do both **Model Its** show breaking apart a factor to multiply?

7 REFLECT

Look back at your **Try It**, strategies by classmates, and **Model Its**. Which models or strategies do you like best for multiplying a three-digit number by a one-digit number? Explain.

....

....

....

....

APPLY IT

Use what you just learned to solve these problems.

8 $2 \times 163 = ?$

Show your work.

Solution ....

9 Find the product of 5 and 738. Estimate to check that your answer is reasonable.
Show your work.

Solution ....

....

10 What is the product of 859 and 7? Show your work.

Solution ....

Practice Multiplying a Three-Digit Number by a One-Digit Number

Study the Example showing one way to multiply a three-digit number by a one-digit number. Then solve problems 1–5.

EXAMPLE

Find the product of 2 and 546.

546

546
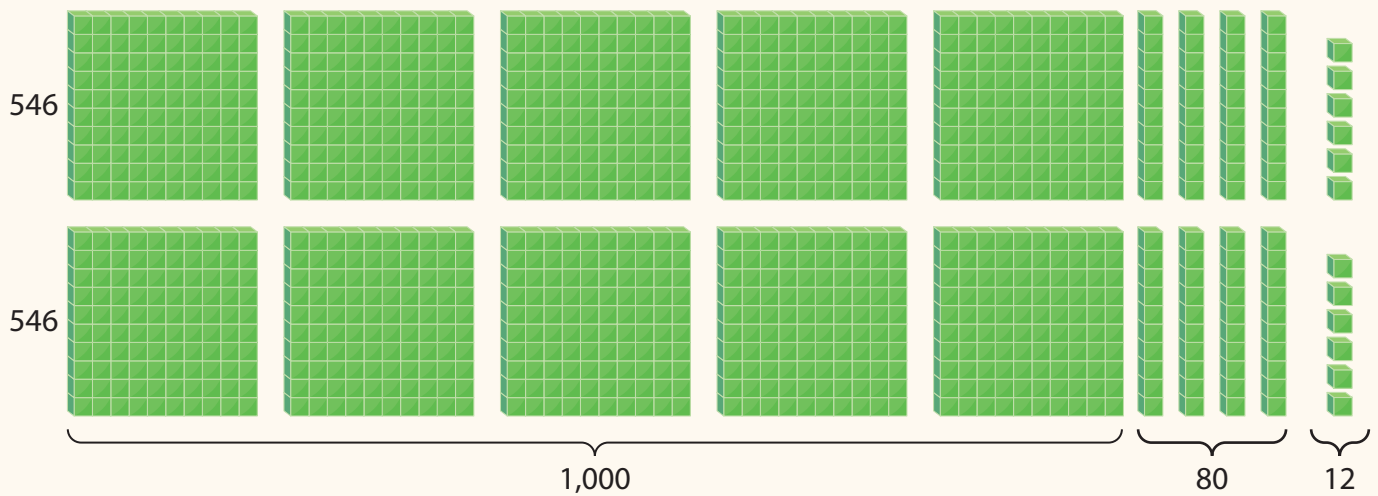
1,000   80   12

$2 \times 546 = 1{,}000 + 80 + 12$
$\qquad\quad = 1{,}092$

1 Look at the multiplication above. Use partial products to find 2×546. Fill in the boxes.

```
      5   4   6
  ×           2
  ───────────────
          1   2   →  □ × 6 ones
          □   □   →  2 × □ tens
+ 1 , 0   0   0   →  2 × □ hundreds
  ───────────────
  □ , □   □   □
```

2 $3 \times 132 = ?$

Show your work.

Solution ....

3   Find 6×915. Show your work.

Solution ....

4   Find the product of 483 and 7. Estimate to check that
your answer is reasonable. Show your work.

Solution ....

....

5   There is a mistake in the multiplication shown.
Explain what mistake is made. Then find
the correct product.

$$
\begin{array}{r}
607 \\
\times \quad 4 \\
\hline
28 \\
+ \ 240 \\
\hline
268
\end{array}
$$

Solution ....

....

Develop Multiplying a Four-Digit Number by a One-Digit Number

Read and try to solve the problem below.

> **Ezekiel has 3 building sets. Each set includes 1,125 pieces. How many pieces are in all 3 sets?**

TRY IT

Math Toolkit
- base-ten blocks
- grid paper
- index cards
- sticky notes
- number lines
- multiplication models

DISCUSS IT

Ask your partner: Do you agree with me? Why or why not?

Tell your partner: I disagree with this part because …

Explore different ways to understand multiplying a four-digit number by a one-digit number.

> **Ezekiel has 3 building sets. Each set includes 1,125 pieces. How many pieces are in all 3 sets?**

PICTURE IT
You can use an area model to help understand the problem.

	1,000	+	100	+	20	+ 5
3	$3 \times 1,000$		3×100		3×20	3×5

$3 \times 1,125 = $ **$(3 \times 1,000)$** $+$ **(3×100)** $+$ **(3×20)** $+$ **(3×5)**
$\qquad\qquad\;\; = $ **3,000** $+$ **300** $+$ **60** $+$ **15**

MODEL IT
You can also multiply the numbers using partial products.

$$\begin{array}{r} 1,125 \\ \times \qquad 3 \\ \hline \mathbf{15} \\ \mathbf{60} \\ \mathbf{300} \\ + \; \mathbf{3,000} \\ \hline ? \end{array}$$

$\mathbf{15} \longrightarrow 3 \times 5$ ones
$\mathbf{60} \longrightarrow 3 \times 2$ tens
$\mathbf{300} \longrightarrow 3 \times 1$ hundred
$\mathbf{3,000} \longrightarrow 3 \times 1$ thousand

The partial products are **15**, **60**, **300**, and **3,000**.

The product is the sum of the partial products.
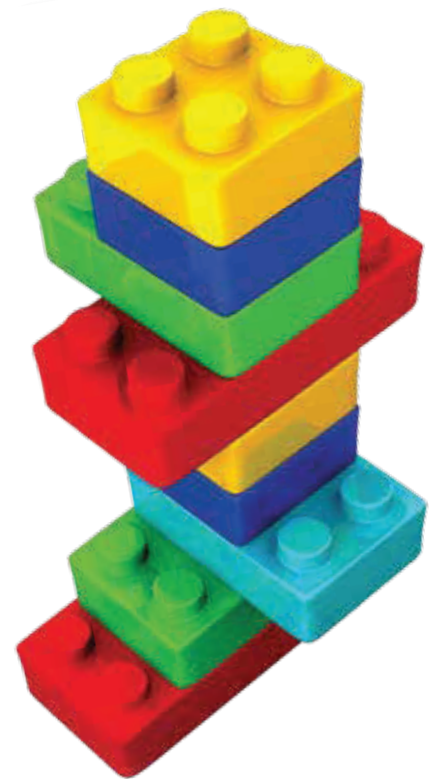
CONNECT IT

Now you will use the problem from the previous page to help you understand how to multiply four-digit numbers by one-digit numbers.

1 What is the expanded form of 1,125? .... + ... + ... + ...

2 How is the expanded form used in the equation in **Picture It**?

3 What is the sum of the numbers in the equation in **Picture It** and the sum of the partial products in **Model It**? ....

4 The partial products in **Model It** shows first multiplying the 3 by the value of the digit in the ones column. Would the product change if you first multiplied the 3 by the value of the digit in the thousands column? Explain.

5 Describe how the factor 3 is used with the factor 1,125 to find the product.

6 Explain how you multiply a four-digit number by a one-digit number.

7 **REFLECT**

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for multiplying a four-digit number by a one-digit number? Explain.

....

....

....

....

....

APPLY IT

Use what you just learned to solve these problems.

8   5,342 × 4 = ? Show your work.

Solution ....

9   Find the product of 7 and 3,928. Estimate to check that your answer is reasonable. Show your work.

Solution ....

....

10   2,041 × 6 = ? Show your work.

Solution ....

Practice Multiplying a Four-Digit Number by a One-Digit Number

Study the Example showing one way to multiply a four-digit number by a one-digit number. Then solve problems 1–5.

EXAMPLE

Jesse's family has 4 music players. Each music player can hold 8,352 songs. What is the total number of songs all 4 music players can hold?

Use an area model.

	8,000	**+**	**300**	**+ 50**	**+ 2**
4	$4 \times 8{,}000$		4×300	4×50	4×2

$$4 \times \mathbf{8{,}352} = (\mathbf{4} \times \mathbf{8{,}000}) + (\mathbf{4} \times \mathbf{300}) + (\mathbf{4} \times \mathbf{50}) + (\mathbf{4} \times \mathbf{2})$$
$$= \quad 32{,}000 \;+\; 1{,}200 \;+\; 200 \;+\; 8$$
$$= \quad 33{,}408$$

All 4 music players can hold a total of 33,408 songs.

1   Complete the multiplication to use partial products to find $4 \times 8{,}352$.

```
        8 , 3  5  2
    ×            4
  _____
             8    ─→ ........ × 2 ones
        2  0  0   ─→ 4 × 5 ....................
    ☐ , ☐ ☐ ☐     ─→ 4 × ........ hundreds
  + 3  2 , 0  0  0 ─→ 4 × 8 ....................
  _____
  ☐ ☐ , ☐ ☐ ☐
```

2   Show how to use partial products to find $5 \times 1{,}643$.

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3 Write 4 × 3,569 in expanded form to show the place value of each digit. Then find the product.

4 Lee earns $1,075 each month. How much does he earn in 6 months? Estimate to check that your answer is reasonable. Show your work.

Solution

5 Look at Callie's work for finding 3 × 9,423.

a. Explain what Callie did wrong.

```
  9,423
×     3
─────────
      9
     60
    120
+ 2,700
─────────
  2,889
```

b. How can using estimation show that Callie's answer is wrong?

c. What is the correct answer?

Refine Multiplying by One-Digit Numbers

Complete the Example below. Then solve problems 1–9.

EXAMPLE

An aquarium has 6 female sea turtles. Each turtle lays up to 1,785 eggs a year. Suppose each turtle lays 1,785 eggs this year. How many eggs do the turtles lay in all this year?

Look at how you could show your work using an area model.

	1,000	+	700	+	80	+	5
6	6 × 1,000		6 × 700		6 × 80		6 × 5

$6 \times 1,785 = (6 \times 1,000) + (6 \times 700) + (6 \times 80) + (6 \times 5)$
$\qquad\qquad = 6,000 + 4,200 + 480 + 30$

Solution ....

> The student multiplied 6 by the value of the digit in each place in 1,785.

PAIR/SHARE
How else could you solve this problem?

APPLY IT

1 Find 435 × 2. Show your work.

> Could you use an array to help you solve this problem?

PAIR/SHARE
How can you check that your answer is reasonable?

Solution ....

2 Find 4 × 6,309. Estimate to check that your answer is reasonable. Show your work.

How could partial products help you solve this problem?

Solution

3 A hardware store has 147 containers of paint. Each container holds 5 gallons of paint. How many gallons of paint does the store have?

Ⓐ 235

Ⓑ 505

Ⓒ 735

Ⓓ 905

Multiply 5 by the value of the digit in each place in 147.

Dale chose Ⓐ as the correct answer. How did he get that answer?

4 Select all the expressions that have a product of 810.

Ⓐ 90×9

Ⓑ 405×2

Ⓒ $(3 \times 20) + (3 \times 70)$

Ⓓ $(2 \times 400) \times (2 \times 5)$

Ⓔ $(5 \times 100) + (5 \times 60) + (5 \times 2)$

5 Mr. Larson is planning a pizza party for 273 people. He plans on 3 slices of pizza for each person. How many slices of pizza is this in all?

Ⓐ 276

Ⓑ 546

Ⓒ 619

Ⓓ 819

6 Find $2,906 \times 2$.

7 Lara says, "When you multiply a three-digit number by a one-digit number, the product is always a four-digit number." Lara writes an equation to support her statement. Greg writes an equation to show that Lara's statement is false.

Complete the equations below to show a possible equation each person could have written.

Lara's equation: $328 \times$ .... = ...

Greg's equation: $328 \times$ .... = ...

8 Fourth-grade students hold a recycling drive. In one week, they collect 1,238 water bottles each day. How many water bottles do the fourth graders collect that week? Estimate to check that your answer is reasonable. Show your work. [*Hint*: There are 7 days in one week.]

Solution ....

....

9 MATH JOURNAL

Explain what strategy you would use to find 357×8. Then use that strategy to find the product.

☑ SELF CHECK   Go back to the Unit 3 Opener and see what you can check off.