Divide Three-Digit Numbers

Lesson Objectives

Content Objectives
- Divide up to three-digit dividends by one-digit divisors, with remainders.
- Use rectangular arrays and area models to divide.
- Use the relationship between multiplication and division to estimate and find a quotient.
- Use place-value understanding and properties of operations to divide.

Language Objectives
- Read aloud division problems.
- Draw an array and an area model to divide.
- Tell how each part of an array or area model relates to the dividend, divisor, quotient, and remainder for a division problem.
- Explain how to use multiplication to check the answer to a division problem.
- Orally define and use the key mathematical terms *quotient, dividend, divisor*, and *remainder* in discussions about division.

Prerequisite Skills
- Recall basic multiplication and division facts.
- Know the properties of operations.
- Understand place value.
- Understand and use rectangular arrays and area models.

Standards for Mathematical Practice (SMP)

SMPs 1, 2, 3, 4, 5, and 6 are integrated in every lesson through the *Try-Discuss-Connect* routine.*

In addition, this lesson particularly emphasizes the following SMPs:

4 Model with mathematics.

5 Use appropriate tools strategically.

7 Look for and make use of structure.

8 Look for and express regularity in repeated reasoning.

*See page 1i to see how every lesson includes these SMPs.

Lesson Vocabulary
- **dividend** the number that is divided by another number.
- **divisor** the number by which another number is divided.

Review the following key terms.
- **divide** to separate into equal groups and find the number in each group or the number of groups.
- **division** an operation used to separate a number of items into equal-sized groups.
- **estimate (noun)** a close guess made using mathematical thinking.
- **estimate (verb)** to give an approximate number or answer based on mathematical thinking.
- **multiple** the product of a given number and any other whole number.
- **quotient** the result of division.
- **remainder** the amount left over when one number does not divide another number a whole number of times.

Learning Progression

In Grade 3 students gained a conceptual understanding of division as a number of equal groups or as a number of objects in each group. They became fluent with basic multiplication and division facts and learned how division and multiplication are related.

In this lesson students apply their knowledge of basic facts, along with place-value understanding and properties of operations, to solve multi-digit division problems. Students divide up to three-digit numbers by one-digit numbers. They use rectangular arrays and area models to divide. Students find quotients with remainders and interpret the remainder in the context of a problem.

In the next lesson students will divide four-digit numbers by one-digit numbers. The focus in Grade 4 is on dividing by one-digit divisors. In Grade 5 students begin to divide with up to four-digit dividends by two-digit divisors.

Lesson Pacing Guide

Whole Class Instruction

SESSION 1 **Explore** *45–60 min*	**Dividing Three-Digit Numbers** • Start *5 min* • Try It *10 min* • Discuss It *10 min* • Connect It *15 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 293–294
SESSION 2 **Develop** *45–60 min*	**Dividing with Arrays and Area Models** • Start *5 min* • Try It *10 min* • Discuss It *10 min* • Model Its *5 min* • Connect It *10 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 299–300 **Fluency** 🖱 Dividing with Arrays and Area Models
SESSION 3 **Develop** *45–60 min*	**Dividing with Estimation and Area Models** • Start *5 min* • Try It *10 min* • Discuss It *10 min* • Model Its *5 min* • Connect It *10 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 305–306 **Fluency** 🖱 Dividing with Estimation and Area Models
SESSION 4 **Refine** *45–60 min*	**Dividing Three-Digit Numbers** • Start *5 min* • Example & Problems 1–3 *15 min* • Practice & Small Group Differentiation *20 min* • Close: Exit Ticket *5 min*	**Lesson Quiz** 🖱 or **Digital Comprehension Check**

Lesson Materials

Lesson
(Required)   none

Activities   *Per pair:* base-ten blocks (6 tens rods, 20 ones units), 115 counters, number cube, 6 paper plates, 7 index cards labeled *17, 24, 30, 39, 41, 48*, and *50*

Activity Sheet: 🖱 1-Centimeter Grid Paper

Math Toolkit   base-ten blocks, counters, bowls, paper plates, grid paper

Digital Math Tools 🖱   Base-Ten Blocks, Multiplication Models

Small Group Differentiation

PREPARE

Ready Prerequisite Lessons

Grade 3
• Lesson 10 Understand the Meaning of Division
• Lesson 11 Understand How Multiplication and Division Are Connected

RETEACH

Tools for Instruction

Grade 3
• Lesson 10 Model Multiplication with Arrays
• Lesson 11 Modeling Division

Grade 4
• Lesson 14 Know Division Facts

REINFORCE

Math Center Activity

Grade 4
• Lesson 14 Dividing by One-Digit Numbers

EXTEND

Enrichment Activity

Grade 4
• Lesson 14 Packing Boxes

Independent Learning

PERSONALIZE

i-Ready Lessons*

Grade 4
• Divide Whole Numbers
• Divide Whole Numbers, Part 2
• Practice: Divide Whole Numbers, Part 1

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*We continually update the Interactive Tutorials. Check the Teacher Toolbox for the most up-to-date offerings for this lesson.

Connect to Family, Community, and Language Development

The following activities and instructional supports provide opportunities to foster school, family, and community involvement and partnerships.

Connect to Family

Use the **Family Letter**—which provides background information, math vocabulary, and an activity— to keep families apprised of what their child is learning and to encourage family involvement.

Divide Three-Digit Numbers

LESSON 14

Dear Family,

This week your child is learning to divide three-digit numbers by one-digit numbers.

Your child is learning about division. He or she is also learning terminology related to division. You may hear your child use the terms dividend, divisor, and quotient. The **dividend** is the number being divided, the **divisor** is the number by which the dividend is divided, and the quotient is the result of the division. If the dividend is not a whole number multiple of the divisor, the amount left is called the remainder.

Your child is learning to divide a three-digit number by a one-digit number. One way your child can divide is by using an area model. With this strategy, your child divides by breaking apart the problem into smaller parts and using repeated subtraction. The problem below shows how to divide 138 by 6.

	?			= 23
	20	+	3	
6	138	$(6 \times 20 = 120)$	$(6 \times 3 = 18)$	
		138	18	
		$- 120$	$- 18$	
		18	0	no remainder

Altogether, there are 20 + 3, or 23, groups of 6 in 138, so **138 ÷ 6 = 23**. Your child is also learning to check the answer by multiplying the quotient, **23**, by the divisor, **6**, to make sure that the product is equal to the dividend of 138. Check: **23 × 6 = 138**, so the answer is correct.

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

289

Teacher Toolbox

ACTIVITY DIVIDING THREE-DIGIT NUMBERS

Do this activity with your child to divide three-digit numbers.

Materials book with a number of pages in the hundreds

- With your child, choose a favorite book and look at the number of pages it has.
- Tell your child that you want to read the entire book in 1 week. Ask your child to help you figure out how many pages you would need to read each day to finish the book in 1 week.
- Have your child use division to find the answer. For example, if the book has 157 pages, your child would divide 157 by 7. (157 ÷ 7 = 22 R 3, which means that there are 22 groups of 7 in 157 and a remainder of 3.)
- You and your child can check the answer to the division problem by using multiplication. If you have a remainder, remember to add the remainder to the product.
- Decide what to do if you have a remainder. Will you read one page each day for the number of days shown by the remainder, or will you read all the remaining pages on the last day?
- Repeat this activity with other favorite books at least three more times.

290

Goal

The goal of the Family Letter is to provide information to family members about dividing three-digit numbers by one-digit numbers. This will enable them to reinforce their student's prior knowledge about division, including division of one-digit and two-digit numbers by one-digit numbers, and support new learning.

- When dividing numbers, family members can support their students by reinforcing the use of the following terms during at-home discussions: *dividend, divisor, quotient*, and *remainder.*

Activity

In the *Dividing Three-Digit Numbers* activity, students and family members divide the number of pages in a book by 7 to see how many pages need to be read each day to complete the book in a week. They are encouraged to use multiplication to check the answer to the division problem.

Math Talk at Home

Encourage students to discuss division problems with their family members by using items they have at home or see on the way home from school.

Conversation Starters Below are additional conversation starters students can write in their Family Letter or math journal to engage family members:

- *If I had 21 markers to divide with everyone in the family, how many markers would each person get?*
- *What do I do if the markers can't be divided into equal groups?*
- *How can we use multiplication to check the answer?*

Connect to Community and Cultural Responsiveness

Use these activities to connect with and leverage the diverse backgrounds and experiences of all students.

Session 3 Use with *Model It*.

• Show a picture of an amusement park or fair ride. Ask students if they have been to an amusement park or fair and if they went on a ride. Explain to students that when they get on an amusement park or fair ride, the sections they sit in are called *cars* and each car can hold two or more people. Ask students if they have ridden a ride at an amusement park or fair. If so, ask them to tell the group the number of people who were in the car with them. If students have not been on an amusement park or fair ride, arrange chairs in a group of five. Have five students sit in the chairs. Say: *If these students were on a ride at an amusement park or fair, there would be five people in one car. How many cars would we need if everyone in the class went on the ride?*

Session 4 Use with *Apply It* problem 3.

• Explain to the students that a piñata is a paper container made to look like a figure, such as an animal or a doll, and is filled with candies or small toys. Point out that piñatas are hung from the ceiling or trees at parties or celebrations. Children are blindfolded and encouraged to hit the piñata with a stick to break it open. When it is broken, the candies or small toys fall out of the piñata and the children grab as many of the items as they can.

• Ask students if they have been to a celebration where a piñata is used. If you have students from countries other than the United States, ask if they have similar traditions. For example, in southern India, a clay pot is used. Like the piñata, the clay pot is struck with a stick until the candies or gifts are released.

Connect to Language Development

For ELLs, use the Differentiated Instruction chart to plan and prepare for specific activities in every session.

ELL **English Language Learners: Differentiated Instruction**

Prepare for Session 1 Use with *Try It*.

Levels 1–3	Levels 2–4	Levels 3–5
Listening/Speaking Use with *Try It*. Write the following terms: • *equal groups* • *array* • *related multiplication equation* Read each term and draw an example. Remind students that they have used these models and strategies in the past to divide numbers. Divide students into 3 groups. Ask each group to select a strategy and use it to find the quotient. When they have solved the problem, have students share their strategies and quotients. Ask groups to listen to and comment on other groups' strategies.	**Reading/Speaking** Use with *Try It*. Write the following on cards: • *equal groups* • *array* • *related multiplication equation* Write brief explanations of each term on separate cards. Shuffle the cards and then have students read and match the terms with the explanations. Ask: *Which strategy do you like to use to solve division problems? Why?* Provide a sentence frame for responses: *I like to use _____ because _____.* Ask students to use the model or strategy they like to solve the problem.	**Speaking/Listening** Use with *Try It*. Ask students to make a list of the models and strategies they have used in the past to solve division problems. Divide the students into partner groups. Have each pair select a strategy and discuss how it is used to solve the problem. If partners need help organizing their thoughts, encourage them to use sequencing words: *first, next, then,* and *last.* When partners have solved the problem, ask them to compare their quotients with other groups and to explain how they used the strategy to solve the problem.

Purpose In this session, students draw on their knowledge of division as equal sharing and the relationship between multiplication and division. They share models to explore how various solution methods are based on place value and the properties of operations. They will look ahead to think about using models, such as an area model, to divide a three-digit number by a one-digit number.

Start

Connect to Prior Knowledge

Why Support students' facility with using area models to represent multiplication in preparation for using area models to represent division.

How Have students explain how to draw an area model to represent and solve 6 × 38.

Use an area model to find 6 × 38.

Solution
228; Draw a rectangle with two parts. One part shows 6 × 30 = 180 and the other shows 6 × 8 = 48. 180 + 48 = 228

TRY IT

Make Sense of the Problem

To support students in making sense of the problem, have them show that they understand that in this problem they can use any strategy to find the quotient of a division problem.

DISCUSS IT

Support Partner Discussion

To reinforce the operation of division, encourage students to use *operation, division*, and *divide* as they talk to each other.

Look for, and prompt as necessary for, understanding of:
• the operation in the problem is division
• 78 is the number you are dividing
• 3 is the number you are dividing by

You have learned about division as equal sharing and about the relationship between multiplication and division. Use what you know to try to solve the problem below.
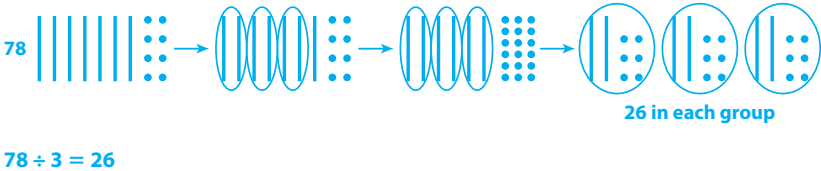
↓ **What is 78 ÷ 3?**

Learning Target
• Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

SMP 1, 2, 3, 4, 5, 6, 7, 8

TRY IT

Possible student work:

Sample A

78 = 75 + 3

3 × 25 = 75
3 × 1 = 3

25 + 1 = 26, so there are 26 groups of 3.
78 ÷ 3 = 26

Sample B

78

26 in each group

78 ÷ 3 = 26

Math Toolkit
• base-ten blocks
• counters
• bowls
• paper plates
• grid paper
• multiplication models

DISCUSS IT

Ask your partner: How did you get started?

Tell your partner: At first, I thought . . .

291

Common Misconception Look for students who do not recognize that this is a division problem and try to multiply 78 and 3 to find the answer. As students present solutions, have them specify what operation they used to find the answer.

Select and Sequence Student Solutions
One possible order for whole class discussion:
• base-ten blocks or counters modeling 78 as 3 groups of 26
• arrays, area models, or drawings showing a total of 78 as 3 groups of 26
• equations using multiplication and repeated subtraction
• breaking apart 78 into tens and ones and dividing each place value by 3

Support Whole Class Discussion
Prompt students to note the relationship between the numbers in each model and the numbers in the problem.

Ask *How do [student name]'s and [student name]'s models show the number you are dividing, the number you are dividing by, and the answer, or quotient?*

Listen for The number you are dividing, 78, is the number you start with. The number you are dividing by, 3, is the number in each group or the number of groups. The quotient is the result of the division.

CONNECT IT

1 LOOK BACK

Look for understanding that students are using the operation of division to solve the problem.

> **✋ Hands-On Activity**
> **Use a base-ten quick drawing to divide.**
>
> **If . . .** *students are unsure about the concept of division,*
>
> **Then . . .** *use this activity to have them model division problems.*
>
> **Materials** For each pair: base-ten blocks (6 tens rods and 20 ones units)
>
> - Provide students with a problem with a two-digit dividend and a one-digit divisor, such as 52 ÷ 4.
> - Tell students that 52 is the number of blocks they will start with and they will divide the blocks into groups of 4.
> - Have partners represent 52 with their blocks. Ask students if they need to regroup to divide their blocks into groups of 4. [yes]
> - Have students do the regrouping and make groups of 4. Have them count the number of groups. Ask students what this represents. [the answer, or quotient; There are 13 groups of 4 in 52.]
> - Repeat the activity for another division problem, such as 45 ÷ 3.

2 – 3 LOOK AHEAD

Point out that an area model shows division as well as multiplication.

Students should be able to complete the area models showing division and use the terms *dividend, divisor, quotient*, and *remainder* to identify the parts of a division equation. For each term defined in problem 3, ask a volunteer to restate the definition.

Ask *How do the area models in problems 2a and 2b show breaking apart 200, the number being divided? How do they show the quotient 50?*

Listen for They show 200 as 100 two times and as 40 five times. They show 50 as the sum of 25 + 25 and as the sum of 10 + 10 + 10 + 10 + 10.


CONNECT IT

1 LOOK BACK

Explain how you found the quotient of 78 ÷ 3.

Possible answer: I drew base-ten blocks to show 78. Then I divided 78 into 3 groups, regrouping the extra ten into ones. 78 ÷ 3 = 26

2 LOOK AHEAD

You can solve division problems in many ways. You can use place value, rectangular arrays, area models, equations, and the relationship between multiplication and division. The area model below shows 200 ÷ 4.

	50
4	**200**
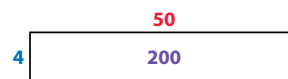
An area model shows both multiplication (**4 × 50 = 200**) and division (**200 ÷ 4 = 50**). You can also use area models to break apart a problem into smaller parts. Fill in the missing labels on two other area models for 200 ÷ 4.

a.

	25 + **25**	
4	**100**	**100**

b.

	10 + 10 + 10 + 10 + 10				
4	**40**	**40**	**40**	**40**	**40**
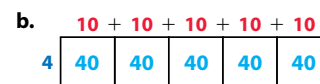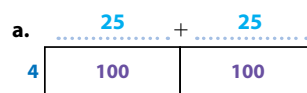
3

a. Sometimes there is a remainder left over when you divide. Fill in the remainder for 21 ÷ 4 in the box at the right.

$$\begin{array}{r} 5\,R\;\boxed{1} \\ 4\overline{)21} \end{array}$$

b. The **dividend** is ____**21**____, the number you are dividing.

c. The **divisor** is ____**4**____, the number you are dividing by.

d. The quotient is ____**5 R 1**____, the result of the division problem.

4 REFLECT

Explain how an area model shows both multiplication and division.

Possible explanation: The numbers on the two sides are multiplied together to equal the total area. The total area can be divided by one of the side numbers to find the other side number.

292

Close: Exit Ticket

4 REFLECT

Look for understanding of how the total area and side lengths in an area model represent both multiplication and division. Student responses should indicate that the product of the two side lengths is the total area and that the total area divided by one of the side lengths equals the other side length. Some student responses may include that the total area can represent both the product in a multiplication problem and the dividend in a division problem.

Common Misconception Look for students who have difficulty understanding how an area model represents both multiplication and division. Give them an area model and write the related multiplication and division facts (e.g., 7 × 8 = 56, 56 ÷ 8 = 7) underneath it. Then discuss where each of the numbers in each equation are represented in the model.

🌎 Real-World Connection
Encourage students to think of everyday situations in which they may encounter the need to divide. Have students share their ideas. Examples include cooking (splitting ingredients or cutting the recipe down in size) and sharing or distributing a number of objects to a number of people.

Solutions

Support Vocabulary Development

1 Ask students to read the terms in the first column of the graphic organizer and put check marks by the terms they can define. Have them share their definitions of the known terms with partners. If students need support defining the words, guide them by using the following activities:

- Remind students that they used the terms *dividend, divisor,* and *quotient* in the **Connect It** problems. Have them see if they can find information there that will help them write the definitions for these terms.

- Write a division equation and talk through solving it, emphasizing the terms *division, dividend, divisor, quotient*, and *remainder*.

- Label a division problem or have students label a division problem with the terms *division, dividend, divisor, quotient*, and *remainder*.

Have students complete the graphic organizer. If students need support writing their definitions in their own words, have them tell you their definitions. Then write the definitions for the students or provide sentence frames for students to complete.

2 Have students define or draw an illustration to represent the term *equal groups*. Ask students the following questions and have them share their responses with partners:

- *Can all dividends be divided into equal groups?*
- *What happens if a dividend cannot be divided into equal groups?*
- *How do you show that there is an amount left over when you have made as many equal groups as you can?*
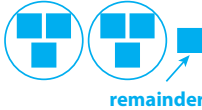
Supplemental Math Vocabulary

- *equation*
- *multiple*

Name: _____

Prepare for Dividing Three-Digit Numbers

1 Think about what you know about division. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can. **Possible answers:**

Word	In My Own Words	Example
division	An operation used to separate a number of objects into equal-sized groups	$12 \div 3 = 4$
dividend	The number that I divide into equal groups	$\textcircled{20} \div 5 = 4$
divisor	The number I divide by in a division problem	$18 \div \textcircled{3} = 6$
quotient	The result of division	$24 \div 8 = \textcircled{3}$
remainder	The amount left over after I make equal groups	remainder

2 Use the term *equal groups* to describe the division problem shown below.

$123 \div 5 = 24 \text{ R } 3$

Possible answer: When you separate 123 objects into 5 equal groups, there are 24 objects in each group and 3 objects left over.

293

3 Assign problem 3 to provide another look at dividing a two-digit number by a one-digit number.

This problem is very similar to the problem about finding 78 ÷ 3. In both problems, students are given a division problem with a two-digit dividend and a one-digit divisor. The question asks students to find 68 ÷ 4.

Students may want to use base-ten blocks.

Suggest that students read the problem three times, asking themselves one of the following questions each time:

• *What is this problem about?*
• *What is the question I am trying to answer?*
• *What information is important?*

Solution:
Students may use any method to solve the division problem. 68 ÷ 4 = 17
Basic

4 Have students solve the problem another way to check their answer.

3 Solve the problem. Show your work.

What is 68 ÷ 4?

Possible student work:

68 = 60 + 8

4 × 15 = 60

4 × 2 = 8

15 + 2 = 17, so there are 17 groups of 4.

Solution 68 ÷ 4 = 17

4 Check your answer. Show your work.

Possible student work:

17 in each group

68 ÷ 4 = 17

294

Purpose In this session, students solve a problem that requires dividing a three-digit number by a one-digit number. Students model the division either on paper or with manipulatives to determine the quotient. The purpose of this problem is to have students develop strategies to divide a three-digit number by a one-digit number.

Start

Connect to Prior Knowledge

Why Support students' facility with the relationship between multiplication and division.

How Have students explain how they can tell if the quotient of 84 ÷ 7 is less than or greater than 10 without computing.

Do you think that the quotient of 84 ÷ 7 is less than 10 or greater than 10?

Explain without computing.

Possible Solution:
I think the quotient is greater than 10 because $7 \times 10 = 70$ and 84 is greater than 70.

Develop Language

Why Make the connection between *multiple* and *multiply*.

How Say: *Here are some multiples of 10*. Then write on the board: *10, 20, 30, 40, …* Follow a similar process for multiples of 4. Ask: *What do you notice?* If necessary, point out to students that the *multiples* of a number are numbers that can be obtained by *multiplying* the number by another whole number.

TRY IT

Make Sense of the Problem

To support students in making sense of the problem, have them identify that the problem is asking them to divide and that they can use what they know about solving other division problems to solve this problem.

Ask *How do you read the problem aloud? How would you describe what you know in this problem?*

Read and try to solve the problem below.

What is 136 ÷ 4?

TRY IT

Possible student work:

Sample A

$136 = 100 + 36$

$100 = 4 \times 25$ and $36 = 4 \times 9$

$25 + 9 = 34$
$136 \div 4 = 34$

Sample B

	25	+	9	= 34
4	100		36	

$136 \div 4 = 34$

🚌 **Math Toolkit**
• base-ten blocks 🔸
• counters
• bowls
• paper plates
• grid paper
• multiplication models 🔸

DISCUSS IT

Ask your partner: Why did you choose that strategy?

Tell your partner: I do not understand how . . .

295

DISCUSS IT

Support Partner Discussion

Encourage students to use the *Discuss It* question and sentence starter on the Student Worktext page as part of their discussion.

Support as needed with questions such as:
• *How did you get started?*
• *What tools or models did you find helpful?*

Common Misconception Look for students who use an operation other than division. Have students read the problem aloud to help them identify that the "÷" symbol means "divided by."

Select and Sequence Student Solutions

One possible order for whole class discussion:
• base-ten blocks or counters modeling 136 as 4 groups of 34 or 34 groups of 4
• arrays, area models, or drawings showing a total of 136 as 4 groups of 34 or as 34 groups of 4
• equations using multiplication and repeated subtraction
• breaking apart 136 into hundreds, tens, and ones and dividing each place value by 4

Support Whole Class Discussion

Compare and connect the different representations and have students identify how they are related.

Ask *Does your model show the problem in one part or in several parts? Where does your model show the dividend, divisor, and quotient?*

Listen for Students should recognize that accurate responses include both the setup of their model and 136 as the dividend, 4 as the divisor, and 34 as the quotient. Responses may include that the model shows the dividend as the total area and the divisor as one side length; the quotient is shown as the other side length or the sum of the lengths of the other side.

MODEL ITS

If no student presented these models, connect them to the student models by pointing out the ways they each represent:

- the dividend of 136
- the divisor of 4
- the quotient

Ask *How are the models alike? How are the models different?*

Listen for Both models show the problem broken into four parts with the number 10 above the first 3 parts and 4 above the last part. The array shows the 136 as the total number of squares in the rows and columns while the area model shows the 136 as the total area of a rectangle.

For an array, prompt students to identify how the array represents the division problem.

- *Why is 10 the first number multiplied by 4?*
- *How do the subtraction problems shown relate to the array?*
- *Why does the model have four parts?*

For an area model, prompt students to identify how the area model represents the division problem.

- *Look at the labels on the first rectangle in the area model. What is known, and what is unknown?*
- *How does the area model show the division problem broken into smaller parts?*
- *What do the numbers above the area model represent?*

Explore different ways to understand dividing three-digit numbers by one-digit numbers.

What is 136 ÷ 4?

MODEL IT

You can use a rectangular array to help you break apart the problem into smaller parts.

The array shows a rectangle divided into 136 squares in 4 rows.

You can use what you know about multiplication and subtraction to break apart 136 and divide the lesser numbers by 4.

| | **Part 1** 10 | + | **Part 2** 10 | + | **Part 3** 10 | + | **Part 4** 4 | = ? |

$(4 \times 10 = 40) \quad (4 \times 10 = 40) \quad (4 \times 10 = 40) \quad (4 \times 4 = 16)$

$$\begin{array}{r} 136 \\ -\ 40 \\ \hline 96 \end{array} \quad \begin{array}{r} 96 \\ -\ 40 \\ \hline 56 \end{array} \quad \begin{array}{r} 56 \\ -\ 40 \\ \hline 16 \end{array} \quad \begin{array}{r} 16 \\ -\ 16 \\ \hline 0 \end{array}$$
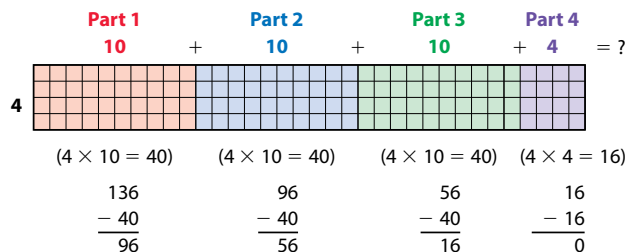
MODEL IT

You can use an area model to help you break apart the problem into smaller parts.

This area model uses multiplication and repeated subtraction. You can break apart 136 and divide the lesser numbers by 4.

$10 \quad + \quad 10 \quad + \quad 10 \quad + \quad 4 \quad = ?$

$(4 \times 10 = 40) \quad (4 \times 10 = 40) \quad (4 \times 10 = 40) \quad (4 \times 4 = 16)$

$$\begin{array}{r} 136 \\ -\ 40 \\ \hline 96 \end{array} \quad \begin{array}{r} 96 \\ -\ 40 \\ \hline 56 \end{array} \quad \begin{array}{r} 56 \\ -\ 40 \\ \hline 16 \end{array} \quad \begin{array}{r} 16 \\ -\ 16 \\ \hline 0 \end{array}$$
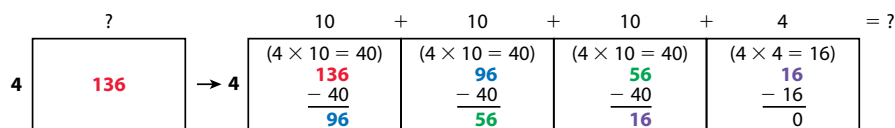
296

Deepen Understanding

Connect Models to Division

SMP 7 Look for structure.

When discussing the array or area model, prompt students to consider how they could be used to show how division is related to repeated subtraction.

Ask *Why do you start the division by subtracting 40 instead of 4 from 136?*

Listen for It is quicker to subtract 40, or 4 groups of 10, at one time than it is to subtract 4 ten times.

Ask *Why do you subtract from 136 in the first part of the model but from 96 in the second part of the model?*

Listen for You subtract from 136 first because it is the dividend. You subtract from 96 in the second part of the model because you already subtracted 40 from 136 in the first part and 96 is left.

Ask *How do you know when you are done using repeated subtraction? How is this shown in the model?*

Listen for You are done subtracting when you get a difference of 0. This is shown in the last part of the model when you subtract 16 from 16 to get 0.

CONNECT IT

- Remind students that one thing that is alike about all the representations is the numbers.
- Explain that on this page, students will use those numbers to find a quotient.

Monitor and Confirm

1 – **3** Check for understanding that:

- 4 is multiplied by 10 to get the area of the first part of each model
- the sum of the areas of each of the four parts of the model is the dividend (136)
- the sum of 10 + 10 + 10 + 4 is the quotient, 34

Support Whole Class Discussion

3 Tell students that this problem will prepare them to provide the explanation required in problem 4.

Ask *How is breaking apart a division problem into smaller parts helpful?*

Listen for I can split the problem into smaller multiplication problems that I know using the divisor as one of the factors.

Ask *How do an array and an area model represent the quotient?*

Listen for The number of columns in an array is the quotient, and the sum of the lengths on one side in the area model is the quotient.

4 Look for the idea that in both models, you break apart 136 and subtract parts until you reach 0.

5 Look for the idea that the quotient multiplied by the divisor equals the dividend.

6 REFLECT

Have all students focus on the strategies used to solve this problem. If time allows, have students share their responses with a partner.

CONNECT IT

Now you will use the problem from the previous page to help you understand how to use a rectangular array and an area model to divide a three-digit number by a one-digit number.

1 Look at the first **Model It**. Why do you think Parts 1, 2, and 3 of the array show multiplying the divisor, 4, by 10? **Possible answer:**
It is easy to multiply by 10, so break apart 136 into multiples of 10.

2 Why is the area model in the second **Model It** broken into four parts?
Possible answer: The four parts show 136 as 40, 40, 40, and 16.

3 What is 136 ÷ 4? ____34____ How do both **Model Its** show how to find the quotient of 136 ÷ 4 in a similar way?
Possible answer: Both models break apart 136 into 40, 40, 40, and 16 to get the same parts of the quotient, 10, 10, 10, and 4. The parts add to 34.

4 Explain how using an array and an area model can help you divide.
Possible answer: Both models help you divide by breaking apart 136 and using multiplication and subtraction. In both, you subtract parts until you reach 0. You add the factors that you multiply the divisor by to find the answer.

5 How can you use multiplication to check that your answer is correct?
Possible answer: $4 \times 34 = (4 \times 30) + (4 \times 4) = 120 + 16 = 136$

6 REFLECT

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

Some students may like the strategy of drawing an array or an area model because it helps them break the problem into smaller parts. The number of columns in the array or the total length of the area model is the quotient.

297

📖 Visual Model
Use grid paper to understand division using an array.

If . . . *students are unsure about how the array model shows division,*

Then . . . *use this activity to have them build an array to model division.*

Materials For each pair: Activity Sheet *1-Centimeter Grid Paper*

- Give each pair a sheet of grid paper to model the problem 132 ÷ 6 = ?.
- Have students write the problem as a multiplication problem with a missing factor, 6 × ? = 132. Ask: *If you drew an array for this multiplication problem, what side length is known?* [6 units]
- Tell them to multiply 6 by a number that is easy to multiply by and that will give a product less than 132, such as 10. Direct students to draw and label a rectangle with side lengths of 6 and 10. Then have them subtract the area of this rectangle from the total area to find the remaining area. [132 − 60 = 72]
- Repeat the process until the remaining area is 0. Discuss with students how the sum of the side lengths (10 + 10 + 2) connects with the missing number in the division and multiplication equations.
- Repeat for other division problems with a three-digit dividend and one-digit divisor, such as 168 ÷ 8 and 126 ÷ 3.

APPLY IT

For problems 7–8, point out that the area model and rectangular array are shown on the Student Worktext page and are started for students. Students complete the models to solve the problems.

7 $132 \div 3 = 44$; See completed area model on the Student Worktext page.

8 $198 \div 6 = 33$; $33 \times 6 = 198$; See completed array on the Student Worktext page.

Close: Exit Ticket

9 **C**; Students may draw an array or area model to show their work.

Error Alert **If** students choose A, B, or D, **then** encourage them to do the problem again by breaking it into smaller parts using an area model.

APPLY IT
Use what you just learned to solve these problems.

7 Complete the area model below to find $132 \div 3$.

| 20 | + | **20** | + | **4** | = | **44** |

3 |

132	72	12
− 60	− **60**	− **12**
72	**12**	**0**
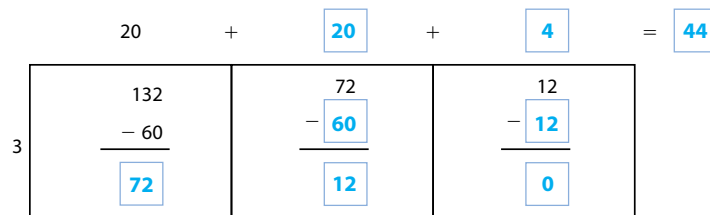
Solution **$132 \div 3 = 44$**

8 Complete the array to find $198 \div 6$. Use multiplication to check your answer. Show your work. **Possible student work:**

| 10 | + | 10 | + | 10 | + | 3 |

6

(6 × 10 = 60)   (6 × 10 = 60)   (6 × 10 = 60)   (6 × 3 = 18)

198	138	78	18
− 60	− 60	− 60	− 18
138	78	18	0
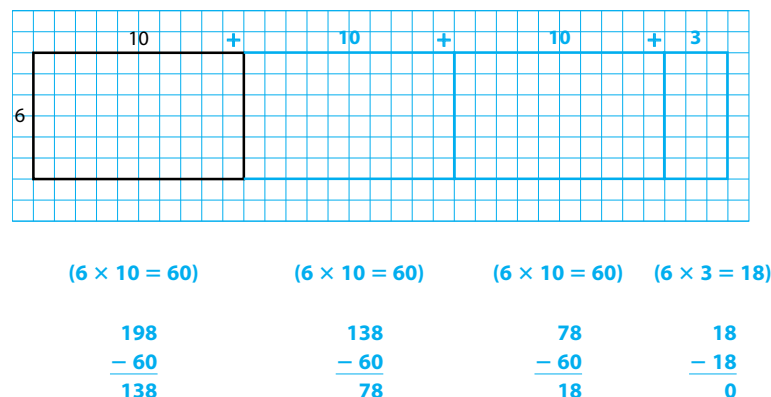
Solution **$198 \div 6 = 33$; $33 \times 6 = (30 \times 6) + (3 \times 6) = 180 + 18 = 198$**

9 What is 224 divided by 7?

Ⓐ 30   Ⓑ 31

Ⓒ 32   Ⓓ 42

Lesson 14 Divide Three-Digit Numbers   **298**

Solutions

1 135 ÷ 5 = 27; See completed area model on the student page.
Medium

2 **a.** 900; 3; 300
b. 600; 5; 120
Basic

Name: _____   **LESSON 14   SESSION 2**

Practice Dividing with Arrays and Area Models

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

EXAMPLE   What is 260 divided by 4?

Use an area model.

$$50 \quad + \quad 10 \quad + \quad 5 \quad = \quad 65$$

4	(4 × 50 = 200) 260 − 200 60	(4 × 10 = 40) 60 − 40 20	(4 × 5 = 20) 20 − 20 0

Use multiplication to check:
$4 \times 65 = (4 \times 60) + (4 \times 5)$
$= 240 + 20$
$= 260$

$260 \div 4 = 65$

1 Complete this area model to find 135 ÷ 5.

$$10 \quad + \quad 10 \quad + \quad 7 \quad = \quad 27$$

5	135 − **50** **85**	85 − **50** **35**	35 − **35** **0**

Solution   **135 ÷ 5 = 27**

2 Identify the dividend, divisor, and quotient.

a. 900 ÷ 3 = 300

dividend: **900**   divisor: **3**   quotient: **300**

b. 120 = 600 ÷ 5

dividend: **600**   divisor: **5**   quotient: **120**

299

Fluency & Skills Practice   [Teacher Toolbox]

Assign *Dividing with Arrays and Area Models*

In this activity students practice dividing three-digit numbers by one-digit numbers. Students are asked to cross out their answer to each problem from a given list as a way to help them check their answers. Students may encounter similar division problems in real-world situations. For example, if 112 books are evenly distributed into 4 boxes, students may determine how many books are put into 1 box.

Fluency and Skills Practice

Dividing with Arrays and Area Models   Name: _____

The answers to problems 1–12 are mixed up at the bottom of the page. Cross out the answers as you complete the problems.

1 606 ÷ 2 = _____   **2** 606 ÷ 3 = _____   **3** 903 ÷ 3 = _____

4 408 ÷ 8 = _____   **5** 243 ÷ 3 = _____   **6** 721 ÷ 7 = _____

7 545 ÷ 5 = _____   **8** 488 ÷ 8 = _____   **9** 816 ÷ 4 = _____

10 728 ÷ 8 = _____   **11** 459 ÷ 9 = _____   **12** 366 ÷ 6 = _____

13 What strategies did you use to solve the problems?

14 Explain how to use multiplication to check your answer to problem 10.

Answers

91	303	61	202	204	109
81	51	301	103	51	61

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3 208 ÷ 8 = 26; See completed array on the student page.
Medium

4 476 ÷ 7 = 68; See possible area model on the student page.
Medium

5 68 × 7 = 476; See possible explanation on the student page.
Medium

3 Complete the array to find 208 ÷ 8. Show your work.   **Possible student work:**
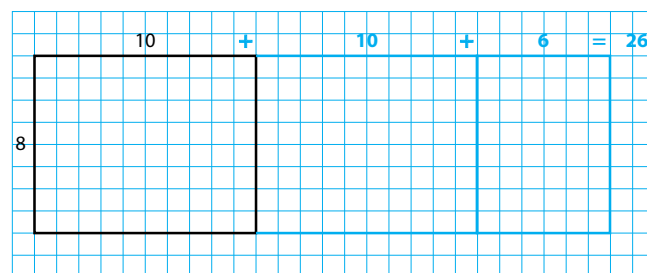
	10	+	10	+	6	=	26

(8 × 10 = 80)	(8 × 10 = 80)	(8 × 6 = 48)
208	128	48
− 80	− 80	− 48
128	48	0

Solution 208 ÷ 8 = 26

4 What is 476 ÷ 7? Use an area model to solve the problem. Show your work.

Possible area model: 60   +   8   = 68

	(7 × 60 = 420)	(7 × 8 = 56)
7	476	56
	− 420	− 56
	56	0
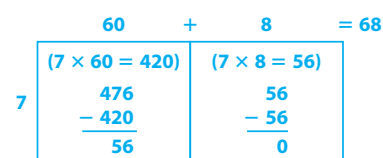
Solution 476 ÷ 7 = 68

5 Explain how to use multiplication to check your answer in problem 4.

Possible answer: Multiply the divisor by the quotient. This product should equal the dividend. 7 × 68 = (7 × 60) + (7 × 8) = 420 + 56 = 476. The product 476 equals the dividend 476, so my answer is correct.

300

Purpose In this session, students solve a problem that requires dividing a three-digit number by a one-digit number and interpreting a remainder. Students model the division either on paper or with manipulatives to find the quotient and interpret the remainder. The purpose of this problem is to have students develop a strategy to estimate a quotient and use the estimate to divide a three-digit number by a one-digit number.

Start

Connect to Prior Knowledge

Why Support students' facility with division involving remainders.

How Have students divide similar problems with and without remainders.

	Solutions
❶ 54 ÷ 3 = ?	1. 18
❷ 55 ÷ 3 = ?	2. 18 R 1
❸ 56 ÷ 3 = ?	3. 18 R 2

Develop Language

Why Establish the connection between the *remainder* in division and the word *remain*.

How Ask the class how many of them have dogs. Ask: *Do you ever feed the **remains** of your dinner to your dog?* Explain that the *remains* of something is what is left over, the part that *remains* or is left behind after the main part is used up. Ask the class to suggest how the word *remainder* as used in division is connected to this idea.

TRY IT

Make Sense of the Problem

To support students in making sense of the problem, have them identify the information given in the problem (number of people, number of people in each car) and what they need to find (number of cars needed).

Ask *How many people fit in one car?*

Read and try to solve the problem below.

There are 232 people waiting in line for an amusement park ride. Each car on the ride will be filled with 5 people. How many cars are needed to hold all the people waiting in line?

TRY IT

Possible student work:

🧰 Math Toolkit
• base-ten blocks
• grid paper
• multiplication models

Sample A

232 = 200 + 32

200 ÷ 5 = 40 and 32 ÷ 5 = 6 R 2

232 ÷ 5 = 46 R 2
46 + 1 = 47 cars

Sample B

	20	+	20	+	6	= 46
5	5 × 20 = 100		5 × 20 = 100		5 × 6 = 30	
	232		132		32	
	− 100		− 100		− 30	
	132		32		2	

46 full cars plus 1 car with 2 people
47 cars are needed.

DISCUSS IT

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

Tell your partner: I disagree with this part because . . .

DISCUSS IT

Support Partner Discussion

Encourage students to use the *Discuss It* question and sentence starter on the Student Worktext page as part of their discussion.

Support as needed with questions such as:

• *What did you do first?*

• *Can you explain why you did it that way?*

Common Misconception Look for students who interpret the remainder incorrectly and think 46 cars are needed rather than 47 cars. Have students multiply to find how many people 46 cars hold [46 × 5 = 230] to see that another car is needed for the additional 2 people.

Select and Sequence Student Solutions

One possible order for whole class discussion:

• base-ten blocks modeling 232 as 46 groups of 5 with 2 left over

• arrays, area models, or drawings showing a total of 232 as 46 groups of 5 and 2 more

• breaking apart 232 into hundreds, tens, and ones and dividing each place value by 5

• using the relationship between multiplication and division to estimate or check the answer

Support Whole Class Discussion

Compare and connect the different representations and have students identify how they are related.

Ask *Does your model show the problem in one part or in several smaller parts? Where does your model show the dividend, divisor, and quotient?*

Listen for Students should recognize that accurate responses include representations that show 232 as the dividend, 5 as the divisor, and 6 as the quotient with a remainder of 2. Responses may include that the model shows the dividend as the total area and the divisor as one side length. The quotient is shown as the other side length or the sum of the lengths on the other side.

MODEL ITS

If no student presented the models from the Model Its, connect them to the student models by pointing out the ways they each represent:

• the dividend of 232
• the divisor of 5
• the quotient

Ask *How is using a table to estimate the quotient helpful when building the area model? How does the area model show that all cars will not be full?*

Listen for The table shows the two tens that the quotient is between. In the last subtraction, there are 2 left over, which is the number of people that do not fit in a full car of 5.

For a table, prompt students to identify how the table can help them estimate the quotient.
• *How do you get the number of cars in each column? the number of people in each column?*
• *Why do you not need to find the number of people in 60 cars?*

For an area model, prompt students to identify how the area model can help them solve the division problem.
• *Why do you start making the model by multiplying 5 by 40?*
• *What do the numbers 40 and 6 above the area model represent?*
• *How does the area model show both multiplication and division?*

Explore how to estimate a quotient and how to use the estimate to divide with an area model.

> **There are 232 people waiting in line for an amusement park ride. Each car on the ride will be filled with 5 people. How many cars are needed to hold all the people waiting in line?**

MODEL IT
You can use the relationship between multiplication and division to estimate the quotient in a division problem with a one-digit divisor.

$$232 \div 5 = ? \text{ and } 5 \times ? = 232$$

Find the products of 5 and multiples of 10. Make a table.

Number of Cars	10	20	30	40	50
Number of People	50	100	150	200	250

The dividend 232 is between **200** and **250**, so the quotient is between **40** and **50**.

MODEL IT
You can use an area model to solve a division problem with a one-digit divisor.

The estimate shows the quotient is between 40 and 50.
Begin the area model by multiplying 40 by 5.
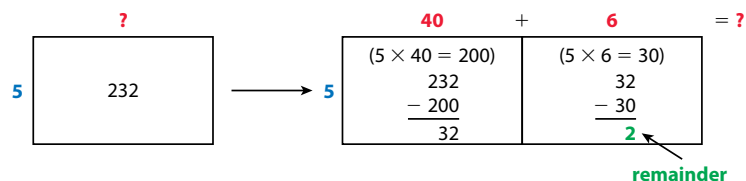
Use multiplication to check:
$$5 \times 46 = (5 \times 40) + (5 \times 6)$$
$$= 200 + 30$$
$$= 230 \qquad\qquad 230 + 2 = 232$$

302

Deepen Understanding
Area Model
SMP 4 Model with mathematics.

When discussing the area model, prompt students to consider the reasoning behind how the model was built.

Ask *Why do you start making the model by multiplying 5 by 40?*

Listen for The estimate shows that the quotient is between 40 and 50, so you multiply the divisor by 40 to get a product less than the dividend.

Ask *Why is the area model broken into two parts? Could an area model be built for 232 ÷ 5 with a different number of parts? Explain.*

Listen for The way the numbers are chosen for each part, it only takes two parts to get a difference close to the dividend. If you choose different numbers to multiply by 5, you could get a different number of parts.

Generalize *Could you multiply the divisor by any number to start making the area model?* Have students explain their reasoning. Listen for understanding that you could multiply the divisor (5) by any number as long as the product is less than the dividend (232).

CONNECT IT

Remind students that in the first *Model It* you estimate the quotient, and in the second *Model It* you use this estimate to help make the area model.

Explain that on this page, students will use the area model to solve the division problem.

Monitor and Confirm

1 – **4** Check for understanding that:

- the table shows multiples of 10, each multiplied by 5, the number of people that fill a car
- 40 is the first number multiplied by 5 in the area model
- add 40 and 6 to find the number of full cars
- 5 does not divide evenly into 232
- the remainder represents 2 more people for whom another car is needed, so interpret the remainder to increase the quotient by 1

Support Whole Class Discussion

1 – **4** Tell students that these problems will prepare them to provide the explanation required in problem 5.

Be sure that students understand that in problem 5, "breaking apart a division problem with an area model" means having more than one part on the area model.

Ask *How is drawing an area model part-by-part helpful?*

Listen for It is easier to work with several lesser numbers rather than one greater number.

Ask *How does using estimation help you build an area model for division?*

Listen for You can start with an estimate of the quotient and then see how much is left to divide.

5 Look for the idea that you can use an estimate of the quotient for the first part of the model and then multiply and subtract, breaking the dividend into parts, to complete the rest of the model.

6 REFLECT

Have all students focus on the strategies used to solve this problem. If time allows, have students share their responses with a partner.

CONNECT IT

Now you will use the problem from the previous page to help you understand how to estimate a quotient and use the estimate to divide with an area model.

1 In the first **Model It**, why do you multiply 5 by multiples of 10?

Possible explanation: You want to find a product that is close to 232.

2 Look at the second **Model It**. How can you find the number of cars that are each filled with 5 people?

Add 40 and 6 to get 46.

3 What does the remainder mean in this problem?

Possible answer: There are two people that need to go in another car.

4 How many cars are needed to hold all the people waiting in line? Explain.

47 cars; Possible explanation: 46 cars with 5 people each, plus 1 car with 2 people in it. 46 + 1 = 47, so 47 cars are needed in all.

5 How can you break apart a division problem with an area model in order to solve the problem?

Possible answer: You can use multiplication and subtraction to divide the total into smaller parts. You can start with an estimate of the quotient, such as 40, and then see how much is left to divide.

6 REFLECT

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

Students may respond that they like the strategy of making a table to estimate the quotient and then drawing an area model because estimating first helps them know what to multiply the divisor by to find the first product in the area model.

303

Hands-On Activity

Use counters to understand division with and without remainders.

If . . . *students are unsure about dividing with remainders,*

Then . . . *use the activity to provide a concrete experience for dividing with remainders.*

Materials For each pair: 50 counters, number cube, 6 paper plates, 7 index cards labeled *17, 24, 30, 39, 41, 48,* and *50*

- Have one partner roll the number cube. (If a 1 is rolled, roll again.) This is the number of plates to set out. This number represents the divisor.
- Have the other partner choose an index card and then count out that number of counters. This number represents the dividend.
- Have students evenly distribute the counters onto the plates. The number of counters on each plate represents the quotient, not including any remainder.
- The number of counters left over, if any, is the remainder.
- Repeat the activity and have students predict whether there will be a remainder before distributing the counters onto the plates.

APPLY IT

For all problems, encourage students to use some kind of model to support their thinking. Allow some leeway in precision of student-drawn models.

7 40 boxes; 39 boxes with 8 hats each and 1 more box with 3 hats; The quotient is between 30 and 40. See completed table and possible area model on the Student Worktext page.

8 58; $3 \times 58 = 174$; See possible work on the Student Worktext page.

Close: Exit Ticket

9 76; See possible work on the Student Worktext page.

Students' solutions should indicate understanding of:

- the operation in the problem is division
- the problem can be broken into smaller parts to make it easier to solve

Error Alert **If** students make a computation error, **then** tell them to carefully check their work and correct any mistakes. Encourage them to use multiplication to check their answer.

LESSON 14 DEVELOP

APPLY IT

Use what you just learned to solve these problems.

7 A store orders 315 hats. The hats are shipped in boxes of 8. How many boxes are needed to ship all the hats? First, find which two multiples of 10 the quotient is between. Then find the quotient using an area model. Show your work. **Possible work:**

$315 \div 8$

Number of Boxes	10	20	30	40
Number of Hats	80	160	240	320

The quotient is between 30 and 40.

$$30 \quad + \quad 9 \quad = 39$$

$(8 \times 30 = 240)$	$(8 \times 9 = 72)$
315	75
$- 240$	$- 72$
75	3

8

$315 \div 8 = 39$ R 3

Solution 40 boxes; 39 boxes with 8 hats each and 1 more box with 3 hats

8 What is 174 divided by 3? Use multiplication to check your answer. Show your work.

Possible student work: $3 \times 50 = 150$ and $3 \times 60 = 180$

$$50 \quad + \quad 8 \quad = 58$$

$(3 \times 50 = 150)$	$(3 \times 8 = 24)$
174	24
$- 150$	$- 24$
24	0

3

Solution 58; $3 \times 58 = (3 \times 50) + (3 \times 8) = 150 + 24 = 174$

9 Find $456 \div 6$. Show your work.

Possible student work:
$6 \times 70 = 420$ and $6 \times 80 = 480$

$$70 \quad + \quad 6 \quad = 76$$

$(6 \times 70 = 420)$	$(6 \times 6 = 36)$
456	36
$- 420$	$- 36$
36	0

6

Solution 76

304

Solutions

1 30; 40
Basic

2 253 ÷ 7 = 36 R 1; See completed area model on the student page.
Basic

Name: _____

Practice Dividing with Estimation and Area Models

Study the Example showing one way to divide a three-digit number by a one-digit number. Then solve problems 1–6.

EXAMPLE

There are 650 flowers to arrange in vases. Each vase holds 6 flowers. How many vases can each be filled with 6 flowers? Are there any flowers left over?

Find 650 ÷ 6.
Use an area model.

```
              100        +        8        = 108
        ┌──────────────┬──────────────────┐
        │(6 × 100 = 600)│  (6 × 8 = 48)    │
    6   │     650      │       50         │
        │   − 600      │     − 48         │
        │     50       │       2          │
        └──────────────┴──────────────────┘
```
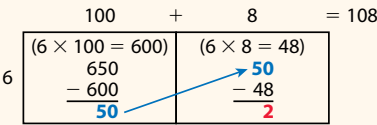
650 ÷ 6 = 108 R **2**

108 vases can each be filled with 6 flowers. There are 2 flowers left over.

---

1 The table lists the products of 7 and multiples of 10. Use the table to help estimate the quotient of 253 ÷ 7.

10	20	30	40	50
70	140	210	280	350

The quotient is between ___**30**___ and ___**40**___ .

2 Use the estimate in problem 1 to find the quotient of 253 ÷ 7. Complete the area model to solve the problem.

```
              30         +        6        = 36
        ┌──────────────┬──────────────────┐
        │(7 × 30 = 210)│  (7 × 6 = 42)    │
    7   │     253      │       43         │
        │   − 210      │     − 42         │
        │     43       │       1          │
        └──────────────┴──────────────────┘
```
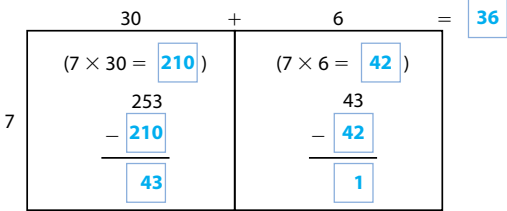
Solution **253 ÷ 7 = 36 R 1** ....

305

Fluency & Skills Practice [Teacher Toolbox]

Assign *Dividing with Estimation and Area Models*

In this activity students check the answer to a division problem that includes a remainder. If the answer is incorrect, students divide to find the correct answer using an area model or another strategy. Students may encounter division problems that do not result in a whole-number answer in real-world situations. In such cases, they may need to interpret the remainder within the context of the situation.

Fluency and Skills Practice

Dividing with Estimation and Area Models   Name: _____

Check the student's answer by multiplying the quotient by the divisor and adding the remainder. If an answer is incorrect, cross out the answer and write the correct quotient, including the remainder.

Division Problems	Student Answers	
637 ÷ 4	~~149 R 1~~ 159 R 1	Check: 149 × 4 = 596 596 + 1 = 597
139 ÷ 2	69 R 1	
188 ÷ 5	38 R 2	
344 ÷ 6	57 R 3	
458 ÷ 9	58 R 8	
222 ÷ 7	31 R 5	
692 ÷ 8	85 R 4	
479 ÷ 3	169 R 2	

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3 Answers will vary. Possible answer: Multiply 5 by 26 to get 130. Add the remainder of 4 to 130 to get 134. Since 134 equals the dividend, the answer is correct.
Medium

4 292 pieces; See possible work on the student page.
Medium

5 See possible explanation on the student page.
Medium

6 Answers will vary. Possible answer: Multiply the divisor by the quotient. The product should equal the dividend. $3 \times 292 = 876$
Medium

3 Explain how to check whether the answer to the division problem below is correct.

$134 \div 5 = 26 \text{ R } 4$

Possible answer: Multiply 5 by 26 to get 130. Add the remainder of 4 to 130 to get 134. Since 134 equals the dividend, the answer is correct.

4 Mike has 876 toy building pieces to share among himself and 2 friends. He wants each person to have an equal number of pieces. How many pieces does each person get? Show your work.

Possible student work:

$200 \quad + \quad 90 \quad + \quad 2 \quad = 292$

$(3 \times 200 = 600)$	$(3 \times 90 = 270)$	$(3 \times 2 = 6)$
876	276	6
$- \ 600$	$- \ 270$	$- \ 6$
276	6	0

3

Solution **292 pieces**

5 Look at how you solved problem 4. Explain how you could use estimation before you divide in order to know whether your answer is reasonable.

Answers will vary. Possible answer: I know that $3 \times 200 = 600$ and $3 \times 300 = 900$. So, I know the quotient will be between 200 and 300. Because 876 is closer to 900 than to 800, the answer will be closer to 300 than to 200.

6 Explain how to use multiplication to check your answer in problem 4.

Answers will vary. Possible answer: Multiply the divisor by the quotient. The product should equal the dividend. $3 \times 292 = 876$. The product 876 equals the dividend 876, so my answer is correct.

306

ELL **English Language Learners: Differentiated Instruction**

Prepare for Session 4 Use with *Apply It*.

Levels 1–3

Listening/Speaking Read *Apply It* problem 7 to students using gestures to support comprehension. Ask: *What number do you think is the dividend?* [$115] *What number do you think is the divisor?* [3] *How do you know?* Reread the problem and hold up a finger for each name. Ask students to work with partners to solve the problem. When pairs have solved the problem, have them explain their process to find the solution. If students point to information or use one- to two-word explanations, restate their responses in complete sentences and have them repeat.

Levels 2–4

Reading/Writing Read *Apply It* problem 7 with students. Write the following on index cards:

- *Write an equation for the problem.*
- *Find two multiples of ten the quotient is between.*
- *Use multiplication and subtraction to find the quotient.*
- *Write the answer in the equation.*
- *Find the amount of money left in the tip jar. Circle the answer to the problem.*

Tell students to write any additional steps to the process on a card and add them to the stack. Shuffle the cards. Have students read them and come to a consensus on an order to put the cards in to solve the problem.

Levels 3–5

Writing/Reading Have students read *Apply It* problem 7. Have students form pairs and give each pair blank index cards. Ask pairs to develop a process for solving the problem and write their steps on the cards. Have them shuffle the cards and exchange them with another pair. Then have each pair read the cards, put them in their preferred order for solving the problem, and then find the solution. Continue the discussion:

- *What would happen if there were 4 people instead of 3?*
- *What would happen if someone put $5 more in the tip jar?*

Encourage students to create their own scenarios.

Purpose In this session, students solve problems involving the division of three-digit numbers by one-digit numbers and then discuss and confirm their answers with a partner.

Before students begin to work, use their responses to the *Check for Understanding* to determine those who will benefit from additional support.

As students complete the Example and problems 1–3, observe and monitor their reasoning to identify groupings for differentiated instruction.

Start

Check for Understanding

Why Confirm understanding of dividing a three-digit number by a one-digit number.

How Have students find 651 divided by 9 using any strategy they want.

What is 651 divided by 9?

Solution
72 R 3

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

EXAMPLE

In art class, 8 students share 104 pieces of felt. Each student gets the same number of pieces. How many pieces of felt does each student get?

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

```
        ?                    10      +      3      =  13
   ┌─────────┐         ┌──────────────┬──────────────┐
   │         │         │ (8 × 10 = 80)│ (8 × 3 = 24) │
 8 │   104   │  → 8    │     104      │      24      │
   │         │         │    − 80      │    − 24      │
   └─────────┘         │     24       │      0       │
                       └──────────────┴──────────────┘
```
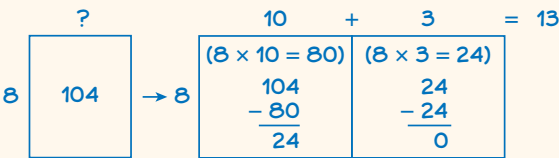
Solution 13 pieces of felt

The student first multiplied 8 × 10. After subtracting 80 from 104, there were still 24 left.

PAIR/SHARE
How else could you solve this problem?

APPLY IT

1 Find 641 ÷ 3. Use multiplication to check your answer. Show your work.

Possible student work:

```
        200      +      10      +      3      = 213
   ┌──────────────┬──────────────┬──────────────┐
   │(3 × 200 = 600)│ (3 × 10 = 30)│ (3 × 3 = 9)  │
 3 │     641      │     41       │     11       │
   │    − 600     │    − 30      │    − 9       │
   │     41       │     11       │     2        │
   └──────────────┴──────────────┴──────────────┘
```
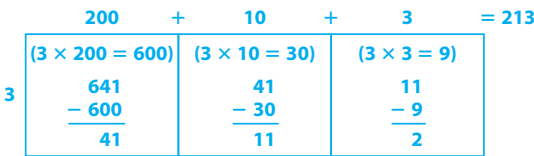
How can you estimate to find how many digits the quotient will have?

PAIR/SHARE
How do you know if there is a remainder in this problem?

Solution 641 ÷ 3 = 213 R 2; 3 × 213 = 639; 639 + 2 = 641

307

Error Alert

If the error is . . .	Students may . . .	To support understanding . . .
72	not have included the remainder in the answer.	Remind students that when there is an amount left over, this is the remainder and needs to be indicated in the answer.
73	have made a computation error.	Remind students of the basic multiplication facts 7 × 3 = 21 and 9 × 3 = 27.
75	have added the remainder to the quotient.	Explain to students that 72 represents the number of times the dividend is divided evenly by the divisor. The remainder of 3 is written separately because it is the amount left over that cannot be divided evenly by the divisor.

EXAMPLE

13 pieces of felt; The area model shown is one way to solve the problem. Students could also solve the problem by using an array.

Look for The problem can be broken into smaller problems by first multiplying 8 by a multiple of 10 and then subtracting the product from 104 and continuing in the same way until the difference is less than the divisor.

APPLY IT

1 213 R 2; 3 × 213 = 639 and 639 + 2 = 641; Students could use estimation to find the two hundreds (200 and 300) that the quotient is between to help them build the area model.
DOK 1

> **Look for** There is a remainder of 2 because after using repeated subtraction, the last difference is 2 rather than 0.

2 738 ÷ 9 = 82; Students could use estimation to find the two tens (80 and 90) that the quotient is between to help them build the area model.
DOK 1

> **Look for** To check the answer, multiply the quotient by the divisor to see if it equals the dividend.

3 **C**; Students could solve the problem by using an area model.

Explain why the other two answer choices are not correct:

A is not correct because the tens digit is incorrect. The student may have thought 6 × 30 = 240 rather than 6 × 40 = 240.

B is not correct because there is no remainder. The student may have made a computation error when subtracting 240 from 252, resulting in 10 instead of 12.
DOK 3

---

2 What is 738 divided by 9? Show your work.

> How could you use an area model to help solve this problem?

Possible student work:

	80	+	2	= 82
	(9 × 80 = 720)		**(9 × 2 = 18)**	
9	738		18	
	− 720		− 18	
	18		0	

Solution 738 ÷ 9 = 82

PAIR/SHARE
How could you use multiplication to check your answer?

3 The Prize Place has 252 toys to divide equally among 6 piñatas. How many toys go into each piñata?

> Will there be any toys left over?

Ⓐ 32

Ⓑ 41 R 4

Ⓒ 42

Ⓓ 420

Erin chose Ⓓ as the correct answer. How did she get that answer?

Erin included the remainder of 0 as the last digit in the answer.

PAIR/SHARE
How can you tell that Erin's answer does not make sense?

SESSION 4 Refine

4 **D**; $5 \times 135 = 675$, so $675 \div 5 = 135$.

E; $6 \times 53 = 318$, so $318 \div 6 = 53$.
DOK 1

5 **C**; Students may use an area model, place value, or the relationship between multiplication and division to solve.

E; Students may use a familiar multiplication fact $4 \times 25 = 100$ to find the value of the related division expression.
DOK 1

6 80; Divide 720 by 3. The quotient is 240. Aiden has 240 quarters. Divide 240 by 3. The quotient is 80. Aiden puts 80 quarters in each pile.
DOK 2

Error Alert Students may not recognize that this is a two-step problem and fail to divide 240 by 3.

---

4 Select all the true division equations.

Ⓐ $255 \div 8 = 31$

Ⓑ $493 \div 7 = 73$

Ⓒ $320 \div 4 = 8$

Ⓓ $675 \div 5 = 135$

Ⓔ $318 \div 6 = 53$

5 Select all the expressions that have a value of 25.

Ⓐ $225 \div 8$

Ⓑ $180 \div 7$

Ⓒ $150 \div 6$

Ⓓ $130 \div 5$

Ⓔ $100 \div 4$

6 Together, Aiden and his two sisters save 720 quarters. They divide the quarters equally. Aiden puts his quarters into 3 equal piles. How many quarters does Aiden put in each pile?
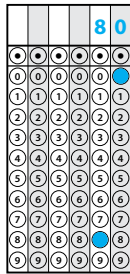
309

Differentiated Instruction

RETEACH

✋ Hands-On Activity
Use counters to understand division.

Students struggling with concepts of dividing with remainders

Will benefit from additional work with dividing with concrete representations

Materials For each pair: 115 counters

- Give students 115 counters. Ask students what number these counters represent all together. [115]
- Display $115 \div 9$. Tell students this problem means to divide the counters representing 115 into equal groups of 9. Have students make as many groups as they can with 9 counters in each.
- Have students count the number of full groups. [12 groups] Have students count the number of counters left over and ask them what this represents. [7 left over; the remainder] Have students write the quotient. [12 R 7] Repeat for $105 \div 8$.

EXTEND

⭐ Challenge Activity
Solve two-step word problems involving division.

Students who have achieved proficiency in dividing three-digit numbers

Will benefit from deepening understanding of solving problems involving division

Have students solve the following problems.

- Jeremy has a bag of 300 raisins. He keeps 20 raisins. He evenly splits the rest among 7 friends. How many raisins does Jeremy give to each friend? [40 raisins]
- Tyneal wants to buy a cell phone that costs $200. She has already saved $92. Tyneal plans to save $9 each month. How many months will it take her to save enough money to buy the cell phone? [12 months]

7 **A**; Divide 115 by 3 because there are 3 workers. Students should recognize that the answer is the remainder, not the quotient.
DOK 2

8 25 almonds with 0 almonds left over; See possible work on the Student Worktext page.
DOK 2

7 James, Micah, and Rebecca work at a restaurant. There is $115 in the tip jar. They decide to divide the tips equally among them and leave any extra money in the jar. How much money do they leave in the jar?

Ⓐ $1
Ⓑ $2
Ⓒ $38
Ⓓ $39

8 Mrs. Long makes 7 snack bags. She uses 175 almonds and shares them evenly among the bags. How many almonds are in each bag? How many almonds are left over? Show your work.

Possible student work:

	20 +	**5** = **25**
7	($7 \times 20 = 140$) $\begin{array}{r} 175 \\ -140 \\ \hline 35 \end{array}$	($7 \times 5 = 35$) $\begin{array}{r} 35 \\ -35 \\ \hline 0 \end{array}$

There are ____**25**____ almonds in each bag.

There are ____**0**____ almonds left over.

9 MATH JOURNAL

Look at the expression $228 \div 6$. What two multiples of 10 is the quotient between? Explain how you know.

30 and 40; Possible explanation: $6 \times 30 = 180$ and $6 \times 40 = 240$. Since 228 is between 180 and 240, the quotient is between 30 and 40.

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

310

REINFORCE

Problems 4–9
Divide three-digit numbers.

All students will benefit from additional work with dividing three-digit numbers by solving problems in a variety of formats.

• Have students work on their own or with a partner to solve the problems.

• Encourage students to show their work.

PERSONALIZE

i-Ready

Provide students with opportunities to work on their personalized instruction path with *i-Ready* Online Instruction to:

• fill prerequisite gaps

• build up grade level skills

Close: Exit Ticket

9 MATH JOURNAL

Student responses should indicate understanding of how to find the two multiples of ten that a quotient is between.

Error Alert **If** students write the two numbers that the dividend is between (180 and 240), **then** remind students that they are finding two multiples of ten that the quotient is between, rather than the dividend.

☑ SELF CHECK Have students consider whether they feel they are ready to check off any new skills on the Unit 3 Opener.

LESSON 15

Divide Four-Digit Numbers

Lesson Objectives

Content Objectives
- Divide up to four-digit dividends by one-digit divisors, with remainders.
- Use area models and partial quotients to divide.
- Use the relationship between multiplication and division to estimate and find a quotient.
- Use place-value understanding and properties of operations to divide.

Language Objectives
- Read aloud division problems.
- Draw an area model to divide.
- Tell how each part of an area model relates to the dividend, divisor, partial quotients, quotient, and remainder for a division problem.
- Write a solution to a division problem using partial quotients.
- Explain how to use multiplication to check the answer to a division problem.
- Orally define and use the key mathematical terms *quotient, dividend, divisor,* and *remainder* in discussions about division.

Prerequisite Skills
- Recall basic multiplication and division facts.
- Divide up to three-digit dividends by one-digit divisors, with remainders.
- Know the properties of operations.
- Understand place value.
- Understand and use area models.

Standards for Mathematical Practice (SMP)

SMPs 1, 2, 3, 4, 5, and 6 are integrated in every lesson through the *Try-Discuss-Connect* routine.*

In addition, this lesson particularly emphasizes the following SMPs:

1 Make sense of problems and persevere in solving them.

5 Use appropriate tools strategically.

7 Look for and make use of structure.

8 Look for and express regularity in repeated reasoning.

---

*See page 1i to see how every lesson includes these SMPs.

Lesson Vocabulary
- **partial quotients** the quotients you get in each step of the partial-quotient strategy. You use place value to find partial quotients. For example, the partial quotients for 2,124 ÷ 4 could be 2,000 ÷ 4 or 500, 100 ÷ 4 or 25, and 24 ÷ 4 or 6.

Review the following key terms.
- **divide** to separate into equal groups and find the number in each group or the number of groups.
- **dividend** the number that is divided by another number.
- **division** an operation used to separate a number of items into equal-sized groups.
- **divisor** the number by which another number is divided.
- **quotient** the result of division.
- **remainder** the amount left over when one number does not divide another number a whole number of times.

Learning Progression

In the previous lesson students divided up to three-digit numbers by one-digit numbers. They used rectangular arrays and area models to divide and applied the idea of repeated subtraction to divide. Students solved problems with and without remainders.

In this lesson students apply their knowledge of dividing, along with their understanding of place value and properties of operations, to divide up to four-digit numbers by one-digit numbers. They use area models to divide, showing multiplication and repeated subtraction part by part. Students also use a vertical division format to find partial quotients to divide. Students find quotients with remainders and interpret the meaning of the remainder in the context of a problem.

In Grade 5 students will find quotients of dividends with up to four digits and divisors with up to two digits.

Lesson Pacing Guide

Whole Class Instruction

SESSION 1 **Explore** 45–60 min	**Dividing Four-Digit Numbers** • Start *5 min* • Try It *10 min* • Discuss It *10 min* • Connect It *15 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 315–316
SESSION 2 **Develop** 45–60 min	**Dividing Four-Digit Numbers** • Start *5 min* • Try It *10 min* • Discuss It *10 min* • Model Its *5 min* • Connect It *10 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 321–322 **Fluency** 🖱 Dividing Four-Digit Numbers
SESSION 3 **Refine** 45–60 min	**Dividing Four-Digit Numbers** • Start *5 min* • Example & Problems 1–3 *15 min* • Practice & Small Group Differentiation *20 min* • Close: Exit Ticket *5 min*	**Lesson Quiz** 🖱 or **Digital Comprehension Check**

Lesson Materials

Lesson *(Required)* — none

Activities — *Per student:* 3 colored pencils or markers
Per pair: base-ten blocks (15 hundreds flats, 30 tens rods), 6 index cards, number cube

Math Toolkit — base-ten blocks, grid paper

Digital Math Tool 🖱 — Multiplication Models

Small Group Differentiation

PREPARE

Ready Prerequisite Lesson

Grade 3
• Lesson 11 Understand How Multiplication and Division Are Connected

RETEACH

Tools for Instruction

Grade 3
• Lesson 11 Modeling Division

Grade 4
• Lesson 15 Divide Using Repeated Subtraction

REINFORCE

Math Center Activity

Grade 4
• Lesson 15 Division Methods

EXTEND

Enrichment Activity

Grade 4
• Lesson 15 Number Strips

i-Ready

Independent Learning

PERSONALIZE

i-Ready Lessons*

Grade 4
• Divide Whole Numbers
• Divide Whole Numbers, Part 2
• Practice: Divide Whole Numbers, Part 2

*We continually update the Interactive Tutorials. Check the Teacher Toolbox for the most up-to-date offerings for this lesson.

Connect to Family, Community, and Language Development

The following activities and instructional supports provide opportunities to foster school, family, and community involvement and partnerships.

Connect to Family

Use the **Family Letter**—which provides background information, math vocabulary, and an activity— to keep families apprised of what their child is learning and to encourage family involvement.

Available in Spanish
Teacher Toolbox

Divide Four-Digit Numbers

LESSON 15

Dear Family,

This week your child is learning to divide four-digit numbers by one-digit numbers.

Your child is learning to divide a four-digit number by a one-digit number.

One way your child can solve a division problem is to find **partial quotients**. With this strategy, your child divides by breaking the dividend into parts.

Below shows one way to divide 2,113 by 4 by finding partial quotients.

```
        3
       25
      500
  4)2,113  ← How many groups of 4 in 2,000? 500
  − 2,000  ← Subtract 500 groups of 4.
      113  ← How many groups of 4 in 100? 25
  −   100  ← Subtract 25 groups of 4.
       13  ← How many groups of 4 in 13? 3
  −    12  ← Subtract 3 groups of 4.
        1
```

The partial quotients are **500, 25**, and **3**. The remainder is **1**.

Altogether, there are **500** + **25** + **3**, or **528**, groups of 4 in 2,113, with 1 left over.

2,113 ÷ 4 = **528 R 1**

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

311

ACTIVITY DIVIDING FOUR-DIGIT NUMBERS

Do this activity with your child to divide four-digit numbers.

Materials 1 number cube (or dot cube)

- Have your child roll a number cube five times to make a division problem with a four-digit number and a one-digit number.

- The first four rolls form the four-digit number in the order of the rolls. The first roll is the thousands digit. The last roll is the divisor.

  Example: Your child rolls a 4, 2, 6, 1, and 3.
  The division problem is 4,261 ÷ 3.

- Have your child find the quotient. There may or may not be a remainder.

  Example: 4,261 ÷ 3 = 1,420 R 1

- Then you multiply to check your child's answer.

  Example: 3 × 1,420 = 4,260
  4,260 + 1 = 4,261
  Your child's answer is correct!

- Switch roles and repeat the activity with you doing the division and your child using multiplication to check the answer.

- The player with the greater quotient wins the round.

- Play three rounds.

312

Goal

The goal of the Family Letter is to give family members opportunities to support new learning of dividing four-digit numbers by one-digit numbers, reinforce prior learning of dividing three-digit numbers by one-digit numbers, and practice the use of division terms in conversations.

Activity

Students and family members are encouraged to construct and solve division problems using numbers generated by rolling number cubes. Once problems are solved, multiplication is used to check answers. Look at the *Dividing Four-Digit Numbers* activity and adjust if needed to connect with students.

Math Talk at Home

Encourage students to discuss division at home with family members, using things they see in their everyday lives. As students learn to divide four-digit numbers by one-digit numbers in this lesson, encourage them to review division of two- and three-digit numbers by one-digit numbers with family members.

Conversation Starters Below are additional conversation starters students can write in their Family Letter or math journal to engage family members:

- *Let's imagine we saw a total of 3,150 stars in 5 nights. How many stars would we see if we saw the same number each night?*

- *Let's imagine I placed 330 stickers on 3 posters. How many stickers would each poster have if I placed the same number on each poster?*

Connect to Community and Cultural Responsiveness

Use these activities to connect with and leverage the diverse backgrounds and experiences of all students.

Session 2 Use with the *Additional Practice Example.*

- Ask students if they have ever been on a hike. If they have, encourage them to share their experiences, such as what they did, where they went, and what they saw. If necessary, explain that hiking is an outdoor activity that involves walking short or long distances. Point out that people who hike follow trails around lakes, in mountains, deserts, and near rivers. Hikers may see animals, such as deer or moose; insects, such as dragonflies and butterflies; and interesting rock formations, trees, or caves. Share pictures of local hiking trails students may be familiar with or famous trails they have heard about, such as the Appalachian Trail. If you have students who were born in countries other than the United States, find pictures of hiking trails from their countries. Explain to students that the length of hiking trails may be measured in kilometers or miles.

Session 3 Use with *Apply It* problem 5.

- Explain to students that a tailor is a person who usually makes men's clothing, such as suits or jackets worn for work or special occasions. The clothes are custom-made to fit a particular person. In this problem, a tailor makes costumes using fabric. Explain to students that fabric is woven or knit material used to make clothing, curtains, sheets, and blankets. Point out that, in the customary system of measurement, fabric is measured in yards and that a specific amount of fabric is used to make different clothing items.
- Ask students if they can think of other things that are made of fabric. Show pictures of fabric that could be used by a tailor. If there are students in the classroom who are from countries other than the United States, find examples of specialized fabric from their first countries. Examples include tartan from Scotland, kimono silk from Japan, kente cloth from Ghana, and linen from Ireland.

Connect to Language Development

For ELLs, use the Differentiated Instruction chart to plan and prepare for specific activities in every session.

ELL English Language Learners: Differentiated Instruction

Prepare for Session 1 Use with *Connect It*.

Levels 1–3

Reading/Speaking Use with *Connect It* problem 2a. Write *dividend*, *divisor*, and *quotient* on index cards and then write the equation $3,200 \div 5 = x$. Ask students to read each label and put it next to the corresponding number or letter in the equation. Point to the 5 in the area model. Say: *5 is the divisor*. Pause so that students can provide the missing term. Ask: *Where is the dividend, 3,200, in the area model?* Guide them to understand that it has been broken into parts, 3,000 (5×600) and 200 (5×40). If students point to the numbers or respond by saying 3,000 and 200, restate their responses in complete sentences and have them repeat. For example: *Yes, 3,200 is broken apart into 3,000 and 200.* Continue the process with problem 2b.

Levels 2–4

Listening/Speaking Use with *Connect It* problem 2a. Write the equation $3,200 \div 5 = x$ and have students label the equation using the terms *dividend, divisor*, and *quotient*. Point to the area model. Have students form pairs and identify the dividend and divisor. Say: *I don't see the dividend, 3,200, in the area model. What happened to it? How will you find the quotient?* Have partners explain their process and then complete the model. Ask: *How did breaking apart 3,200 in the area model make it easier to solve the problem?* Encourage students to use complete sentences. Continue the process with problem 2b.

Levels 3–5

Speaking/Writing Use with *Connect It* problem 2a. Have students form pairs and complete the area model. Ask: *What process did you use to solve the problem using the area model?* Ask partners to discuss their processes. Have them draw a large illustration of the area model on chart paper. Encourage partners to label it with information written on index cards detailing what they did to solve the problem. For example: *We multiplied 5 × 600, and then we subtracted the product, 3,000, from the dividend, 3,200.* Partners attach this information near the first box of their area models. When partners have completed the labeling, continue the process with problem 2b.

Purpose In this session, students draw on their knowledge of dividing three-digit numbers by one-digit numbers and of the relationship between multiplication and division. They share models to explore how various solution methods are based on place-value concepts. They will look ahead to think about using area models and partial quotients to divide a four-digit number by a one-digit number.

Start

Connect to Prior Knowledge

Why Support students' facility with dividing a three-digit number, foreshadowing the division of a four-digit number they will work with to solve the problem.

How Have students estimate the quotient of $510 \div 7$ by finding the two multiples of ten that the quotient is between.

What two multiples of ten is the quotient of $510 \div 7$ between?

.... and ....

Solution
70 and 80

TRY IT

Make Sense of the Problem

To support students in making sense of the problem, have them show that they understand what is given in the division problem and what they need to find out.

DISCUSS IT

Support Partner Discussion

To reinforce the operation of division, encourage students to use the terms *divide* and *quotient* as they talk to each other.

Look for, and prompt as necessary for, understanding that:

• 1,400 is the number you are dividing
• 4 is the number you are dividing by
• the quotient is the number you are trying to find

Explore Dividing Four-Digit Numbers

Previously, you learned about dividing three-digit numbers by one-digit numbers. Use what you know to try to solve the problem below.

↓ **What is 1,400 ÷ 4?**

Learning Target

• Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

SMP 1, 2, 3, 4, 5, 6, 7, 8

TRY IT

Possible student work:

Sample A

$1,400 = 1,000 + 400$

$4 \times 100 = 400$
$4 \times 25 = 100$, so $4 \times 250 = 1,000$

$250 + 100 = 350$
$1,400 \div 4 = 350$

Sample B

	100	+	100	+	100	+	50	= 350
4	(4 × 100 = 400)		(4 × 100 = 400)		(4 × 100 = 400)		(4 × 50 = 200)	
	1,400		1,000		600		200	
	− 400		− 400		− 400		− 200	
	1,000		600		200		0	

$1,400 \div 4 = 350$

Math Toolkit
• base-ten blocks
• grid paper
• multiplication models

DISCUSS IT

Ask your partner: Can you explain that again?

Tell your partner: I started by . . .

313

Common Misconception Look for students who are not comfortable with basic facts and think that 4 divides evenly into 14. As students present solutions, have them specify the reasoning they used and correct any misunderstandings.

Select and Sequence Student Solutions

One possible order for whole class discussion:

• base-ten blocks modeling 1,400 as 4 groups of 350
• area models or drawings showing a total of 1,400 as 4 groups of 350
• equations using multiplication and repeated subtraction
• breaking apart 1,400 and using place value to divide

Support Whole Class Discussion

Prompt students to note the relationship between the numbers in each model and the numbers in the problem.

Ask *How do [student name]'s and [student name]'s models show the dividend, divisor, and quotient?*

Listen for The dividend, 1,400, is the number you start with. The divisor, 4, is the number in each group or the number of groups. The quotient is the result of the division.

CONNECT IT

1 LOOK BACK

Look for understanding that you can break apart 1,400 into numbers that are more easily divided by 4 and use related multiplication equations and mental math or an area model to divide.

> ### ✋ Hands-On Activity
>
> **If . . .** *students are unsure about the concept of dividing a four-digit number by a one-digit number,*
>
> **Then . . .** *use this activity to have them model similar problems.*
>
> ***Materials*** For each pair: base-ten blocks (15 hundreds flats and 30 tens rods), 6 index cards
>
> - Provide students with base-ten blocks and the problem 1,200 ÷ 5. Tell students that they will use the base-ten blocks to model the problem.
> - Have partners model 1,200 with 12 hundreds flats and then distribute them as evenly as possible onto 5 index cards that represent the divisor. [2 hundreds flats on each index card with 2 hundreds flats left over]
> - Then have students regroup the 2 hundreds flats left over as 20 tens rods and distribute them as evenly as possible onto the 5 index cards. [4 tens rods on each index card with 0 tens rods left over]
> - Ask students what number the blocks on the index cards represent. [240, the quotient]
> - Repeat the activity for similar division problems, such as 1,500 ÷ 6.

2 LOOK AHEAD

Point out that both strategies—the area model and using partial quotients—involve breaking the problem into smaller parts by using multiplication and repeated subtraction.

Students should be able to use the term *partial quotient* to identify the quotients you get in each step. Students should also be able to recognize that the partial quotients are added together to get the final quotient. Students will spend more time learning about partial quotients in the Additional Practice.
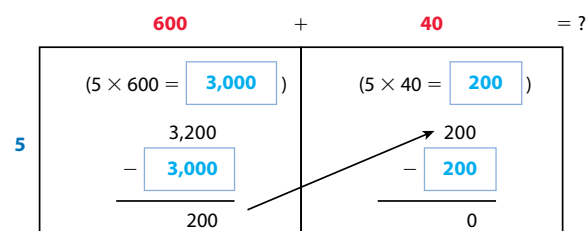

CONNECT IT

1 LOOK BACK

Explain how you found the quotient of 1,400 ÷ 4. **Possible answer:**

I broke apart 1,400 into 1,000 and 400. I used what I know about multiplication to divide 1,000 and 400 by 4. 1,400 ÷ 4 = 350.

2 LOOK AHEAD

You can divide four-digit numbers in many ways.

a. Complete the area model to show 3,200 ÷ 5.

$$600 \quad + \quad 40 \quad = ?$$

$(5 \times 600 =$ **3,000** $)$	$(5 \times 40 =$ **200** $)$
3,200	200
− **3,000**	− **200**
200	0

(divisor **5**)

The quotient of 3,200 ÷ 5 is **640** .

b. Another way to find 3,200 ÷ 5 is by using **partial quotients**. Complete the division that shows using partial quotients.

```
        40
       600
   5)3,200   ←  How many groups of 5 in 3,000?   600
   − 3,000       Subtract 600 groups of 5.
   −  2 00   ←  How many groups of 5 in 200?      40
      200        Subtract 40 groups of 5.
        0    ←  The remainder is                   0  .
```

Add the partial quotients shown above the problem to find the quotient:

600 + **40** = **640** .

3 REFLECT

How are the strategies of using an area model and partial quotients alike?

Possible answer: They both break the problem into 3,000 ÷ 5 and 200 ÷ 5.

Both add the number of subtracted groups of 5 to get the quotient.

3 REFLECT

Look for understanding of how the area model relates to the partial quotient strategy and that in both strategies the partial quotients are added to find the quotient. Student responses may include that the problem shown is broken into the same number of parts or into the same two problems (3,000 ÷ 5 and 200 ÷ 5).

Common Misconception Look for students who do not mention in their explanations that both strategies show the problem broken into the same two parts. Have students connect the two parts in the area model to the two partial quotients in the partial quotient strategy.

🌎 Real-World Connection

Encourage students to think of everyday situations in which they may encounter the need to divide. Have students share their ideas. Examples include science (distributing an amount of something equally), finance (distributing an amount of money equally), and distributing a number of objects to a number of people.

Solutions

Support Vocabulary Development

1 Ask students to circle the term *partial*. Remind them that they used this term when they learned about *partial products* for multiplication. Have students tell partners the meaning of the term *partial* (part). Ask students to underline the term *quotient*. Remind them that they used the term *quotient* for division. Have students tell partners the meaning of the term *quotient* (the result of a division problem).

Say: *You learned that partial products is a strategy used to multiply multi-digit numbers. You add partial products to find the product. Now you will show what you know about partial* **quotients***.* Encourage students to complete their concept maps. If students need support providing examples of partial quotients, ask them to review the problems they solved during the session.

2 Have students look at the area model and identify the math operations used to solve the division problem: multiplication, subtraction, and addition. Ask students to explain how each of these operations is used to solve the problem. Responses may include the following information:

- *Multiplication is used to find the number of groups of 8 in each part of the dividend.*
- *Repeated subtraction is used to find how much of the dividend is left to divide.*
- *Addition is used to find the sum of the partial quotients to get the quotient.*

Supplemental Math Vocabulary

- *division*
- *dividend*
- *divisor*

Name: _____ **LESSON 15 SESSION 1**

Prepare for Dividing Four-Digit Numbers

1 Think about what you know about division. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can. **Possible answers:**

What Is It?

A strategy used to divide multi-digit numbers.

What I Know About It

I can use an area model to help find partial quotients for a division problem.

partial quotients

Examples

$$\begin{array}{r} 50 \\ 250 \end{array} \Big\rangle 250 + 50 = 300$$

$$4\overline{)1,200}$$
$$\underline{-1,000}$$
$$200$$
$$\underline{-200}$$
$$0$$

Examples

$1,000 \div 4 = ?$

$1,000 = 100 \times 10$

$100 \div 4 = 25$
$25 \times 10 = 250$
$1,000 \div 4 = 250$

Examples

$2,500 \div 5 = ?$
$2,500 = 2,000 + 500$
$2,000 \div 5 = 400$
$500 \div 5 = 100$
$2,500 \div 5 = 400 + 100$
$ = 500$
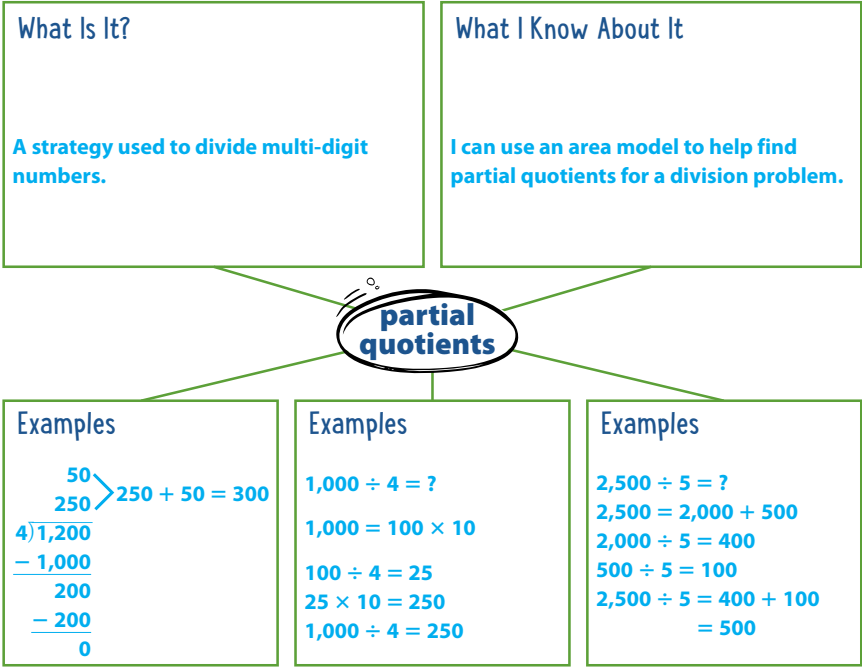
2 Complete the area model to show $2,200 \div 8$. Add the partial quotients to solve the division problem.

Possible answer: 200 + 70 + 5 = 275, so 2,200 ÷ 8 = 275.

	200 +	70 +	5 = ?
	(8 × 200 = **1,600**)	(8 × 70 = **560**)	(8 × 5 = **40**)
8	2,200	600	40
	− **1,600**	− **560**	− **40**
	600	40	0

315
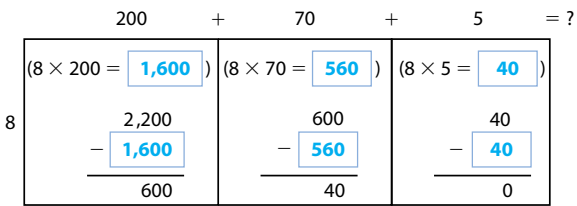
3 Assign problem 3 to provide another look at dividing a four-digit number by a one-digit number.

This problem is very similar to the problem about finding the quotient of 1,400 ÷ 4. In both problems, students are given a division problem that has a four-digit dividend and a one-digit divisor. The question asks students to find the quotient of 1,500 ÷ 6.

Suggest that students read the problem three times, asking themselves one of the following questions each time:

- *What is this problem about?*
- *What is the question I am trying to answer?*
- *What information is important?*

Solution:
Students may use any method to solve the division problem. 1,500 ÷ 6 = 250
Basic

4 Have students solve the problem another way to check their answer.

---

3 Solve the problem. Show your work.

 What is 1,500 ÷ 6?

 Possible student work:
 1,500 = 1,200 + 300

 6 × 200 = 1,200 and 6 × 50 = 300
 200 + 50 = 250

 1,500 ÷ 6 = 250

 Solution 250

4 Check your answer. Show your work.

 Possible student work:

	200	+	50	= 250
6	(6 × 200 = 1,200) 1,500 − 1,200 300		(6 × 50 = 300) 300 − 300 0	

 1,500 ÷ 6 = 250

316

ELL **English Language Learners: Differentiated Instruction**

Prepare for Session 2
Use with *Connect It*.

Levels 1–3

Speaking/Reading Read *Connect It* problem 6 to students. Ask: *What models or strategies are used to solve the **Try It** and **Model It** problems?* Write student responses. Ensure that the following phrases are included: *area model*, *breaking apart the problem into easier problems*, and *partial quotients*. Encourage students, as needed, to expand their responses by pausing so that they can add information. For example: *Yes, we use addition to add the partial quotients*. Have students repeat the information in their own words. Ask: *Which model or strategy do you like best for dividing a four-digit number by a one-digit number?* Provide a sentence frame: *I like using _____ the best.* Have students practice reading their responses to partners.

Levels 2–4

Writing/Reading Read *Connect It* problem 6 with students and have them form pairs. Have partners develop a list of models and strategies used to solve the *Try It* and *Model It* problems. Ensure responses include *area model*, *breaking apart the problem*, and *partial quotients*. If partners think of other models or strategies, encourage them to add them to their lists. Ask partners to share their lists and add to them as needed. Ask: *Which model or strategy do you like best for dividing a four-digit number by a one-digit number? Why?* Provide a sentence frame: *I like using _____ the best because _____.* Ask students to read their responses to partners before writing them.

Levels 3–5

Reading/Writing Have partners read *Connect It* problem 6 and then develop a list of models and strategies used to solve the *Try It* and *Model It* problems. Ask: *Which model or strategy do you like best for dividing a four-digit number by a one-digit number? Why?* Ask students to write their responses and then read them to partners. Divide students into three groups. Assign each group a model or strategy. Ask them to write a division problem, use the model or strategy to solve it, and write a description of how the model/strategy is used. Encourage students to use sequencing words, as needed. Have students read their descriptions to other groups.

Purpose In this session, students solve a problem that requires dividing a four-digit number by a one-digit number. Students model the division, either on paper or with manipulatives, to determine the quotient. The purpose of this problem is to have students develop strategies to divide a four-digit number by a one-digit number.

Start

Connect to Prior Learning

Why Support students' facility with division involving remainders.

How Have students use mental math and number sense to determine if given division problems have a remainder without computing the solution.

Without computing, tell whether each division problem has a remainder. Explain your reasoning.
❶ 480 ÷ 2
❷ 175 ÷ 5
❸ 723 ÷ 9

Solution
1. No; 2. No; 3. Yes;
Possible explanations: Even numbers are evenly divisible by 2; numbers ending in "5" are evenly divisible by 5; 9 divides evenly into 720 but not into 3.

Develop Language

Why Develop a deeper understanding of the term *repeated subtraction*.

How Say: *When you "repeat" something, you do it over and over again*. Explain to students that when they use the area model to divide, they have to subtract to find out how much of the dividend is left to divide. This is what is meant by *repeated* subtraction.

TRY IT

Make Sense of the Problem

To support students in making sense of the problem, have them identify what the numbers 2,125 and 4 represent in the problem.

Ask *How many tablets fit in one box?*

LESSON 15

SESSION 2 ● ● ○

Develop Dividing Four-Digit Numbers

Read and try to solve the problem below.

A factory has 2,125 tablets to ship to stores. It can ship 4 tablets in each box. How many full boxes can the factory ship?

TRY IT

🧰 **Math Toolkit**
• base-ten blocks
• grid paper
• multiplication models

Possible student work:

Sample A

$2,125 = 2,000 + 100 + 25$

$2,000 \div 4 = 500 \qquad 100 \div 4 = 25 \qquad 25 \div 4 = 6 \text{ R } 1$

$500 + 25 + 6 = 531$

$2,125 \div 4 = 531 \text{ R } 1$

The factory can ship 531 full boxes.

Sample B

	500 +	30 +	1 = 531
4	$(4 \times 500 = 2,000)$ 2,125 − 2,000 125	$(4 \times 30 = 120)$ 125 − 120 5	$(4 \times 1 = 4)$ 5 − 4 1

$2,125 \div 4 = 531 \text{ R } 1$

531 full boxes

DISCUSS IT

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

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

317

DISCUSS IT

Support Partner Discussion

Encourage students to use the terms *quotient* and *remainder* as they discuss their solutions.

Support as needed with questions such as:

• *How would you explain the strategy you used to solve the problem?*

• *Do you think that your answer makes sense?*

Common Misconception Look for students who interpret *full box* and the remainder incorrectly and think there are 532 full boxes rather than 531 full boxes with some leftover tablets.

Select and Sequence Student Solutions

One possible order for whole class discussion:

• base-ten blocks modeling 2,125 as 4 groups of 531 with 1 left over

• area models or drawings showing a total of 2,125 as 4 groups of 531 and 1 more

• equations using multiplication and repeated subtraction

• breaking apart 2,125 and using place value to divide

Support Whole Class Discussion

Compare and connect the different representations and have students identify how they are related.

Ask *Where does your model show the partial quotients? the final quotient? the remainder?*

Listen for Students should recognize that accurate responses include representations that show 2,125 as the dividend, 4 as the divisor, and 531 with a remainder of 1 as the quotient. Responses may include that the sum of the partial quotients represents the number of full boxes. The remainder is shown as the amount left and represents the number of tablets not shipped.

MODEL ITS

If no student presented these models, connect them to the student models by pointing out the ways they each represent:

• the dividend of 2,125 and divisor of 4
• the partial quotients of 500, 25, and 6
• the remainder of 1

Ask *How do the numbers above each part of the area model compare to the partial quotients in the second* Model It?

Listen for The numbers above each part of the area model are the same as the partial quotients 500, 25, and 6. You add these three numbers for the final quotient.

For an area model, prompt students to identify where multiplication and repeated subtraction are shown in the model.

• *Why is 500 the first number multiplied by 4?*
• *Why does the model have three parts?*
• *What is the same about the computations shown in each part?*

For a strategy using partial quotients, prompt students to identify each of the partial quotients and the remainder.

• *How would you explain the process used to find each number above the division problem?*
• *How is the way the numbers above the division problem are lined up helpful?*
• *How do you know if there is a remainder?*

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

> A factory has 2,125 tablets to ship to stores. It can ship 4 tablets in each box. How many full boxes can the factory ship?

MODEL IT
You can use an area model to break apart the problem into smaller parts.

The area model shows how to use multiplication and repeated subtraction to divide 2,125 by 4.

remainder
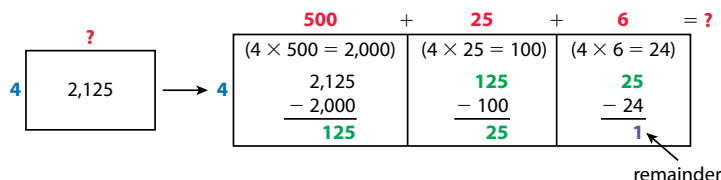
MODEL IT
You can also find partial quotients to divide.

Divide each place value of 2,125 by 4.

```
        6
       25
      500
   4)2,125  ←  How many groups of 4 in 2,000? 500
    − 2,000     Subtract 500 groups of 4.
        125  ←  How many groups of 4 in 100? 25
    −   100     Subtract 25 groups of 4.
         25  ←  How many groups of 4 in 25? 6
    −    24     Subtract 6 groups of 4.
          1
```

The partial quotients are **500**, **25**, and **6**.

The quotient includes both the sum of the partial quotients and the remainder, the amount left over.

318

Deepen Understanding
Partial Quotient Strategy
SMP 7 Look for structure.

When discussing the partial-quotient strategy, prompt students to consider how place-value concepts are used to compute the partial quotients.

Ask *Why do you think the number of groups of 4 in 2,000 is used to find the first partial quotient?*

Listen for There are 2 thousands in 2,125, and 4 evenly divides 2,000.

Ask *How is the partial quotient of 25 determined? Could a number other than 25 have been computed for the second partial quotient? Explain.*

Listen for The second partial quotient is found by finding the number of groups of 4 in 100, the value of the hundreds place. The partial quotient can be any number that is a multiple of 4 and is less than 125. For example, you can find the number of groups of 4 in 120, which is 30.

Generalize *Is it true that there is more than one set of partial quotients that add to the same final quotient?* Have students explain their reasoning. Listen for understanding that different partial quotients can be found that have the same sum.

CONNECT IT

- Remind students that one thing that is alike about all the representations is the numbers.
- Explain that on this page, students will use those numbers to find a quotient and interpret a remainder to solve the problem.

Monitor and Confirm

1 – 3 Check for understanding that:
- the partial quotients are 500, 25, and 6
- the quotient includes both the sum of the partial quotients and the remainder, 1

Support Whole Class Discussion

1 – 3 Tell students that these problems will prepare them to answer problem 4.

Be sure students understand that problem 2 is asking them to interpret the remainder in the context of the word problem.

Deepen Understanding
Interpreting Remainders
SMP 1 Make sense of problems.

To support discussion of problem 2, prompt students to consider how the remainder affects the answer.

Ask *How does having a remainder in this problem affect the answer?*

Listen for The remainder can be ignored because the problem only asks for the number of full boxes that can be shipped.

Ask *If the factory could ship partially filled boxes, how would the answer change?*

Listen for It would ship 532 boxes, and the last box would only have one tablet in it.

4 Look for the idea that both strategies use multiplication and repeated subtraction to divide.

5 Look for the idea that to check the answer, you multiply the quotient by the divisor and add any remainder. This result should equal the dividend.

6 REFLECT

Have all students focus on the strategies used to solve this problem. If time allows, have students share their responses with a partner.

CONNECT IT

Now you will use the problem from the previous page to help you understand how to use an area model and partial quotients to divide a four-digit number by a one-digit number.

1 Look at the first **Model It**. How can you find the number of full boxes the factory can ship?

Add 500, 25, and 6 to get 531 full boxes.

2 What does the remainder mean in this problem?

There is one tablet not shipped because the box isn't full.

3 Look at the second **Model It**. How does using the partial quotients strategy help you find the quotient of $2{,}125 \div 4$? **Possible answer:**

Add the partial quotients first: $500 + 25 + 6 = 531$. The remainder is 1, the amount left over after subtracting 531 groups of 4. So, the quotient is 531 R 1.

4 Explain how using an area model and partial quotients can help you divide a four-digit number by a one-digit number.

Possible answer: Both ways help you divide parts using multiplication and then subtracting from the total. You subtract parts until you reach 0 or a number less than the divisor. Then you add the partial quotients and identify the remainder, if there is one, to find the quotient.

5 How can you check that your answer is correct? **Possible answer:**

$531 \times 4 = 2{,}124$. Add the remainder of 1. $2{,}124 + 1 = 2{,}125$

6 REFLECT

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

Some students may like dividing using partial quotients because they are using place value and repeated subtraction to help them divide.

319

Visual Model
Connect an area model for multiplication to an area model for division.

If . . . *students are unsure about using an area model to divide,*

Then . . . *use the activity to help students see the connection between multiplication and division in an area model.*

Materials For each student: 3 different-colored pencils or markers

- Have students draw an area model for 3×951. Tell them to use one color to label the width 3 and then divide the model into three parts, using a second color to label the parts 900, 50, and 1.
- Discuss how both the length and width of the model are given but the total area is not known. Have students find the area of each part by writing a multiplication equation in the third color inside each part and then adding the products to find the total area. [$2{,}700 + 150 + 3 = 2{,}853$]
- Explain how this same area model represents $2{,}853 \div 3$. Ask: *Where are the divisor, dividend, and quotient shown?* [3 is the divisor, the sum of the three products inside the area model is the dividend 2,853, and the sum of the numbers 900, 50, and 1 above the model is the quotient, 951.]
- Repeat the activity for other problems, such as 4×362.

APPLY IT

For all problems, encourage students to use an area model or the partial quotient strategy to support their thinking. Allow some leeway in precision of student-drawn models.

7 $1,010 \div 9 = 112$ R 2; Students could also solve the problem using the partial quotient strategy.

8 $1,458 \div 3 = 486$; $486 \times 3 = 1,458$; Students could also solve the problem using an area model.

Close: Exit Ticket

9 **B**; $6 \times 900 = 5,400$, and $5,783 - 5,400 = 383$; $6 \times 60 = 360$, and $383 - 360 = 23$; $6 \times 3 = 18$, and $23 - 18 = 5$. The partial quotients are $900 + 60 + 3$ with a remainder of 5.

Error Alert If students choose A or D, **then** remind them that they need to write the remainder as part of the answer. Also encourage them to use multiplication to check their answer. If they find that their answer does not check, tell them to do their work again using another method.

APPLY IT

Use what you just learned to solve these problems.

7 Find $1,010 \div 9$. Show your work.

Possible student work:

	100	+	10	+	2	= 112
9	(9 × 100 = 900) 1,010 − 900 110		(9 × 10 = 90) 110 − 90 20		(9 × 2 = 18) 20 − 18 2	

Solution $1,010 \div 9 = 112$ R 2

8 Find $1,458 \div 3$. Use multiplication to check your answer. Show your work.

Possible student work:

```
            6
           80
          400
     3)1,458
      − 1,200
          258
        − 240
           18
         − 18
            0
```

Solution $1,458 \div 3 = 486$; $3 \times 486 = (3 \times 400) + (3 \times 80) + (3 \times 6) = 1,200 + 240 + 18 = 1,458$

9 What is 5,783 divided by 6?

Ⓐ 963

Ⓑ 963 R 5

Ⓒ 964 R 5

Ⓓ 968

320

Solutions

1 1,647; See completed problem on the student page.
Medium

2 1,126 R 3; See completed problem on the student page.
Medium

Practice Dividing Four-Digit Numbers

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

EXAMPLE

A group of hikers plan to take 3 hours to hike a trail 5,380 meters long. They want to hike the same distance each hour. How many meters do they plan to hike each hour?

$$5,380 \div 3 = \textbf{1,793 R 1}$$

The hikers plan to hike 1,793 meters each hour. Then they will need to hike 1 more meter to reach the end of the trail.

```
            3
           90
          700
        1,000
   3)5,380  ←— There are 1,000 groups of 3 in 5,000.
   − 3,000    Subtract 1,000 groups of 3.
     2,380  ←— There are 700 groups of 3 in 2,380.
   − 2,100    Subtract 700 groups of 3.
       280  ←— There are 90 groups of 3 in 280.
   −   270    Subtract 90 groups of 3.
        10  ←— There are 3 groups of 3 in 10.
   −     9    Subtract 3 groups of 3.
         1
```

Possible student work shown for problems 1 and 2.

1 Complete the division problem using partial quotients.

$$8,235 \div 5 = \underline{\textbf{1,647}}$$

```
              7
          4   0
        6 0   0
      1 0 0   0
   5)8, 2 3   5
   − 5 0 0   0
     3 2 3   5
   − 3 0 0   0
       2 3   5
   −   2 0   0
         3   5
   −     3   5
             0
```

2 Complete the division problem using partial quotients.

$$4,507 \div 4 = \underline{\textbf{1,126 R 3}}$$

```
              6
          2   0
        1 0   0
      1 0 0   0
   4)4, 5 0   7
   − 4 0 0   0
       5 0   7
   −   4 0   0
       1 0   7
   −     8   0
           2 7
   −     2 4
             3
```

Fluency & Skills Practice [Teacher Toolbox]

Assign *Dividing Four-Digit Numbers*

In this activity students practice estimating and finding quotients of four-digit numbers divided by one-digit numbers. It is helpful for students to practice estimating quotients as students may estimate quotients in real-world situations in which an exact answer is not needed. Students may use a variety of strategies to find the quotients, such as finding partial quotients.

Fluency and Skills Practice

Dividing Four-Digit Numbers   Name: _____

Estimate. Circle all the problems with quotients between 500 and 1,500. Then find the exact quotients of only the problems you circled.

1 2,508 ÷ 4 = _____   2 7,058 ÷ 9 = _____   3 2,726 ÷ 9 = _____

4 7,429 ÷ 5 = _____   5 3,506 ÷ 9 = _____   6 8,318 ÷ 8 = _____

7 7,645 ÷ 2 = _____   8 4,113 ÷ 4 = _____   9 3,196 ÷ 5 = _____

10 5,018 ÷ 7 = _____   11 8,127 ÷ 6 = _____   12 6,155 ÷ 3 = _____

13 What strategies did you use to estimate the quotients? Explain.

14 Check one of your answers by solving it with a different strategy. Show your work.

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③ 175 weeks with 5 days left over; See possible work on the student page. Students could also show their work using the partial quotients strategy.
Medium

④ 255 boxes; See possible work on the student page. Students could also show their work using an area model.
Medium

⑤ **B**; Round the dividend of 7,000 to the nearest thousand. 7,000 divided by 5 is 1,400. The estimated quotient of 1,400 is close to 1,419.

D; 6 evenly divides a dividend of 3,600, resulting in a quotient of 600. There will be a remainder because 6 does not evenly divide 3,875. An estimated quotient of 600 with a remainder is close to 645 R 5.
Challenge

③ One week has 7 days. How many weeks do 1,230 days make? What does the remainder mean? Show your work. **Possible student work:**

	100	+	70	+	5	= 175
7	(7 × 100 = 700)		(7 × 70 = 490)		(7 × 5 = 35)	
	1,230		530		40	
	− 700		− 490		− 35	
	530		40		5	

Solution **175 weeks; There are 5 days left over that do not make a full week.**

④ Mugs can be packed with up to 6 mugs in each box. How many boxes are needed to pack 1,528 mugs? Show your work.

Possible student work shown.
1,528 ÷ 6 = 254 R 4

```
              4
             50
            200
      6)1,528
       − 1,200
            328
         − 300
             28
          − 24
              4
```

Solution **255 boxes**

⑤ Use estimation to select all the true division equations.

Ⓐ 4,960 ÷ 2 = 9,920

Ⓑ 7,095 ÷ 5 = 1,419

Ⓒ 9,621 ÷ 3 = 230 R 7

Ⓓ 3,875 ÷ 6 = 645 R 5

Ⓔ 5,004 ÷ 4 = 251

Vocabulary

remainder the amount left over when one number does not divide another number a whole number of times.

5,380 ÷ 8 = 672 R 4
       ↑
    remainder

322

ELL **English Language Learners: Differentiated Instruction**

Prepare for Session 3
Use with *Apply It*.

Levels 1–3

Listening/Speaking Simplify the language to improve comprehension for *Apply It* problem 2. Ask students to listen as you read it. Say: *Rogelio has 2,490 stamps. He divides them equally among his 6 children. How many stamps does each child get?* Encourage students to write an equation to solve the problem [2,490 ÷ 6 = ?]. Ask guiding questions: *What is the dividend? What is the divisor? What mathematical symbols are used in division equations?* Divide students into pairs. Ask each group to select a model or strategy to solve the problem: *area model* or *partial quotients*. Have students compare their answers with other pairs.

Levels 2–4

Listening/Speaking Read *Apply It* problem 2 with students. Ask students to listen to partners retell the information. Ask: *What equation could you use to represent the problem?* Encourage students to write an equation and explain to partners what the numbers and symbols represent. Ask questions to guide the conversations: *What number is the dividend? How do you know? What number is the divisor? How do you know? What do the symbols represent?*

Ask partners to solve the problem using the model or strategy of their choice. When they have solved the problem, have them explain the process they followed to other partner groups.

Levels 3–5

Reading/Speaking Encourage students to read *Apply It* problem 2 with a partner, write an equation, and then discuss with their partner what the numbers and symbols represent. Remind them to use the terms *divisor, dividend, represents, equals*, and *divide* in their discussions. Have partners solve the problem and then explain the process they followed to other pairs. Provide the following questions to guide conversations: *How did using an area model, partial quotients help you solve the problem? Did you estimate what the quotient would be before you started dividing? How did you check to see if your answer was correct?*

Purpose In this session, students solve division problems involving four-digit dividends and one-digit divisors and then discuss and confirm their answers with a partner.

Before students begin to work, use their responses to the *Check for Understanding* to determine those who will benefit from additional support.

As students complete the Example and problems 1–3, observe and monitor their reasoning to identify groupings for differentiated instruction.

Start

Check for Understanding

Why Confirm understanding of dividing a four-digit number by a one-digit number.

How Have students find 2,894 ÷ 8 using any strategy they want.

What is 2,894 divided by 8?

Solution
361 R 6

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

EXAMPLE

What is 7,824 divided by 3?

Look at how you could show your work using partial quotients.

```
        8 ⎫
      600 ⎬ partial quotients
    2,000 ⎭
  3)7,824  ← 7,824 is between 3 × 2,000 and 3 × 3,000,
  − 6,000       so subtract 3 × 2,000.
    1,824  ← 1,824 is between 3 × 600 and 3 × 700,
  − 1,800       so subtract 3 × 600.
       24  ← 24 is equal to 3 × 8,
  −    24       so subtract 3 × 8.
        0  ← There is no remainder.
```

7,824 ÷ 3 = 2,000 + 600 + 8

Solution 2,608

The student added the partial quotients to find 7,824 ÷ 3.

PAIR/SHARE
How else could you solve this problem?

APPLY IT

1 Find 1,359 ÷ 4. Use multiplication to check your answer. Show your work.

	300	+	30	+	9	= 339
4	(4 × 300 = 1,200)		(4 × 30 = 120)		(4 × 9 = 36)	
	1,359		159		39	
	− 1,200		− 120		− 36	
	159		39		3	

Solution 1,359 ÷ 4 = 339 R 3; 4 × 339 = 1,356; 1,356 + 3 = 1,359

How many digits will the quotient have?

PAIR/SHARE
How do you know if there is a remainder in this problem?

Error Alert

If the error is . . .	Students may . . .	To support understanding . . .
361	not have included the remainder in the answer.	Remind students that when there is an amount left over, this is the remainder and needs to be indicated in the answer with a capital letter R.
461 R 6	have multiplied partial products for hundreds incorrectly.	Remind students of the basic multiplication facts 8 × 3 = 24 and 8 × 4 = 32.
367	have added the remainder to the quotient.	Explain to students that first they find the number of times the dividend is divided evenly by the divisor. The remainder is written separately from that number because it is the amount left over that cannot be divided evenly by the divisor.

EXAMPLE

2,608; The partial quotient strategy shown is one way to solve the problem. Students could also solve the problem by using an area model.

Look for Add the partial quotients 2,000, 600, and 8 to get the quotient of 2,608. There is no remainder.

APPLY IT

1 $1,359 \div 4 = 339$ R 3; $339 \times 4 = 1,356$ and $1,356 + 3 = 1,359$. Students could also solve the problem by using the partial quotients strategy.
DOK 1

Look for There is a remainder of 3 because after using repeated subtraction the last difference $39 - 36 = 3$ rather than 0. There are 3 digits in the quotient because the 1 in the thousands place of the dividend is less than the divisor of 4.

2 415 stamps; Students could also solve the problem by using an area model.
DOK 1

Look for To check the answer, multiply the quotient by the divisor to see if it equals the dividend. $415 \times 6 = 2,490$

3 **C**; Divide in each place by 5 and then add the partial quotients $(200 + 40 + 14 + 1)$.

Explain why the other two answer choices are not correct:

A is not correct because 111×5 does not equal 1,275.

B is not correct because 251×5 does not equal 1,275.
DOK 3

---

2 Rogelio has 2,490 stamps in his collection. He divides his stamps equally among his 6 children. How many stamps does each child get? Show your work.

How could you use partial quotients to solve this problem?

Possible student work:

$$
\begin{array}{r}
5 \\
10 \\
400 \\
6\overline{)2{,}490} \\
-2{,}400 \\
\hline
90 \\
-60 \\
\hline
30 \\
-30 \\
\hline
0
\end{array}
$$

PAIR/SHARE
How could you use multiplication to check your answer?

Solution **415 stamps**

3 There are 1,275 people waiting to try out for a show. The people wait in 5 rooms. Each room has the same number of people. How many people are in each room?

Can you use multiplication to help solve the problem?

Ⓐ 111

Ⓑ 251

Ⓒ 255

Ⓓ 1,270

Awan chose Ⓓ as the correct answer. How did he get that answer?

Awan subtracted 5 from 1,275 instead of dividing 1,275 by 5.

PAIR/SHARE
How can you tell that Awan's answer does not make sense?

324

---

4 **A**; $6 \times 8 = 48$
DOK 2

5 213 costumes; There are 4 yards of fabric left over; Students could also solve the problem by using an area model.
DOK 2

6 **D**; The number of groups of 5 in 35 is 7, so 7 should be the partial quotient above 35 in the area model.
DOK 2

Error Alert If students choose A, then ask them to add the numbers in the boxes of the area model to confirm the sum is equal to the dividend, 6,035.

---

4 Mariah finds $4,048 \div 8$ using partial quotients as shown at the right. What partial quotient goes in the box?

$$
\begin{array}{r}
\square \\
500 \\
8\overline{)4,048} \\
-4,000 \\
\hline
48 \\
-48 \\
\hline
0
\end{array}
$$

Ⓐ 6

Ⓑ 7

Ⓒ 60

Ⓓ 70

5 A tailor has 1,495 yards of fabric to make costumes. He needs 7 yards of fabric for each costume. How many costumes can the tailor make? Is there any fabric left over? Show your work.

Possible student work:

$$
\begin{array}{r}
3 \\
10 \\
200 \\
7\overline{)1,495} \\
-1,400 \\
\hline
95 \\
-70 \\
\hline
25 \\
-21 \\
\hline
4
\end{array}
$$

Solution **213 costumes; There are 4 yards of fabric left over.**

6 Jack uses partial quotients to solve $6,035 \div 5$ as shown by the area model.

	1,000	+ 200 + 35
5	5,000	1,000 | 35

Jack says the quotient is 1,235 because $1,000 + 200 + 35 = 1,235$. What did Jack do wrong?

Ⓐ Jack broke apart 6,035 incorrectly.

Ⓑ Jack wrote the incorrect partial quotient above 1,000.

Ⓒ Jack should have subtracted 35 from $1,000 + 200$.

Ⓓ Jack wrote the incorrect partial quotient above 35.

325

Differentiated Instruction

RETEACH

✋ Hands-On Activity
Use number cubes to find partial quotients.

Students struggling with the concept of partial quotients

Will benefit from additional work with finding the first partial quotient in a division problem

Materials For each pair: number cube

• Have students roll the number cube five times to form a four-digit number and a one-digit number.

• Suppose the numbers rolled are 1, 1, 3, 2, and 4. Ask students if there is a number close to 1,132 that 4 divides evenly. Tell students that they can use the relationship between multiplication and division to find the first partial quotient by multiplying 4 by multiples of 100 until they get close to 1,132 without going over 1,132. Try $100 \times 4 = 100$ (too low), $200 \times 4 = 800$, $300 \times 4 = 1,200$ (too high). This means that the quotient is between 200 and 300, so use 200 as the first partial quotient. Have students complete the division.

• Repeat the activity for other four-digit dividends and one-digit divisors.

EXTEND

★ Challenge Activity
Write and solve a division word problem.

**Students** who have achieved proficiency

Will benefit from deepening understanding of dividing a four-digit number by a one-digit number

• Have students write a division word problem that could be solved using an equation with a four-digit dividend and a one-digit divisor.

• After students have written their problems, have them exchange their problems with a partner and then solve their partner's word problem.

7 753; Students may draw an area model or use a partial-quotients strategy to find the quotient.
DOK 1

8 There are 125 beads on each necklace. There are 7 beads left over; See possible area model on the Student Worktext page. Students could also use partial quotients to solve the problem.
DOK 2

7 Find 2,259 ÷ 3.
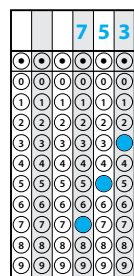
8 Trina has a box of 1,132 beads to make necklaces. She wants to use as many of the beads as possible to make 9 necklaces. She uses the same number of beads for each necklace. How many beads are on each necklace? How many beads are left over? Show your work.

Possible student work:

	100	+	20	+	5	= 125
9	(9 × 100 = 900) 1,132 − 900 232		(9 × 20 = 180) 232 − 180 52		(9 × 5 = 45) 52 − 45 7	

There are ___**125**___ beads on each necklace.

There are ___**7**___ beads left over.

9 MATH JOURNAL

Explain how to divide 3,625 by 4 using partial quotients.

Possible answer: Subtract 4 × 900 = 3,600 from 3,625 to get 25. Then subtract 4 × 6 = 24 from 25 to get 1. 900 + 6 = 906. So, 3,625 ÷ 4 = 906 R 1.

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

326

REINFORCE

Problems 4–9
Divide four-digit numbers.

All students will benefit from additional work with dividing four-digit numbers by solving problems in a variety of formats.

• Have students work on their own or with a partner to solve the problems.

• Encourage students to show their work.

PERSONALIZE

i-Ready

Provide students with opportunities to work on their personalized instruction path with *i-Ready* Online Instruction to:

• fill prerequisite gaps

• build up grade level skills

Close: Exit Ticket

9 MATH JOURNAL

Student responses should indicate an understanding of finding partial quotients by using multiplication and repeated subtraction. Their responses should also show the understanding that the sum of the partial quotients is one part of the final quotient and the remainder is the other part.

Error Alert **If** students forget to account for the remainder in their answer, **then** remind them that if they find a difference greater than 0 but less than the divisor, they must write the remainder, starting with R, as part of their answer.

☑ SELF CHECK Have students consider whether they feel they are ready to check off any new skills on the Unit 3 Opener.