Topic G

Division of Thousands, Hundreds, Tens, and Ones

4.OA.3, 4.NBT.6, 4.NBT.1

Focus Standard:

4.OA.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

4.NBT.6 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.

Instructional Days: 8

Coherence -Links from:
G3–M1 Properties of Multiplication and Division and Problem Solving with Units of 2–5 and 10
G3–M3 Multiplication and Division with Units of 0, 1, 6–9, and Multiples of 10
G5–M2 Multi-Digit Whole Number and Decimal Fraction Operations

Topic G extends to division with three- and four-digit dividends using place value understanding. Students begin the topic by connecting multiplication of 10, 100, and 1,000 by single-digit numbers from Topic B to division of multiples of 10, 100, and 1,000 in Lesson 26. Using unit language, students find their division facts allow them to divide much larger numbers.

\[
\begin{align*}
12 \text{ ones} & \div 4 = 3 \text{ ones} \\
12 \div 4 & = 3 \\
12 \text{ tens} & \div 4 = 3 \text{ tens} \\
120 & \div 4 = 30 \\
12 \text{ hundreds} & \div 4 = 3 \text{ hundreds} \\
1200 & \div 4 = 300
\end{align*}
\]

In Lesson 27, number disks support students visually as they decompose each unit before dividing. This lesson contains a first use script on the steps of solving long division using number disks and the algorithm in tandem (4.NBT.6).
Students then move to the abstract level in Lessons 28 and 29, recording long division with place value understanding, first of three-digit, then four-digit numbers using small divisors. In Lesson 30, students practice dividing when there are zeros in the dividend or in the quotient.

Lessons 31 and 32 give students opportunities to apply their understanding of division by solving word problems (4.OA.3). In Lesson 31, students identify word problems as number of groups unknown or group size unknown, modeled using tape diagrams. Lesson 32 applies their place value understanding of solving long division using larger divisors of 6, 7, 8, and 9. Concluding this topic, Lesson 33 has students make connections between the area model, and the standard algorithm for long division.

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Lesson 26

Objective: Divide multiples of 10, 100, and 1,000 by single-digit numbers.

Suggested Lesson Structure

- Fluency Practice (12 minutes)
- Application Problem (5 minutes)
- Concept Development (30 minutes)
- Student Debrief (13 minutes)

Total Time (60 minutes)

Fluency Practice (12 minutes)

- Show Values with Number Disks 4.NBT.1 (4 minutes)
- Group Counting 4.OA.1 (2 minutes)
- List Multiples and Factors 4.OA.4 (2 minutes)
- List Prime Numbers 4.OA.4 (4 minutes)

Show Values with Number Disks (4 minutes)

Materials: (S) Personal white boards

Note: This fluency drill prepares students for Lesson 26’s Concept Development.

Repeat the process from G4–M3–Lesson 15 with the following possible sequence (projected or drawn):

- 1 hundreds disk, 2 tens disks, and 3 ones disks.
- 4 hundreds disks, 1 tens disk, and 3 ones disks.
- 3 hundreds disks, 15 tens disks, and 2 ones disks.
- 2 hundreds disks and 15 tens disks, and 3 ones disks.

Follow by having students draw disks for 524, 231, and 513.

Group Counting (2 minutes)

Note: Group counting reviews factors and multiples.

Direct students to count forward and backward, occasionally changing the direction of the count.
Lesson 26

Divide multiples of 10, 100, and 1,000 by single-digit numbers.

Date: 8/28/13

List Multiples and Factors (2 minutes)

Materials: (S) Personal white boards

Note: This fluency reviews Lesson 24’s content and give students practice in remembering the difference between factors and multiples.

Repeat the process from G4–M3–Lesson 25 with the following possible sequence: 4 multiples of 6 starting from 60, the 4 factors of 6, the 4 factors of 8, 4 multiples of 8 starting at 80, the 3 factors of 9, and 4 multiples of 9 starting at 90.

List Prime Numbers (4 minutes)

Materials: (S) Paper

Note: This drill reviews Lesson 25’s Concept Development.

T: What’s the smallest prime number?
S: 2.
T: On your paper, write 2.
T: Are there any other even prime numbers?
S: No.
T: On your paper, list the prime numbers in order from least to greatest, beginning with 2. You have one minute.
S: (List the prime numbers.)
T: Compare your list with your partner’s. Look for differences in your lists and decide who is correct. Make changes to your lists as needed. You have two minutes.

Application Problem (5 minutes)

A coffee shop uses 8-ounce mugs to make all of its coffee drinks. In one week, they served 30 cups of espresso, 400 lattes, and 5,000 cups of coffee. How many ounces of coffee drinks did they serve in one week?

\[
\begin{align*}
8 \times 30 &= 8 \times (3 \times 10) \\
&= 8 \times 30 \\
&= 240

divide by 10

8 \times 400 &= 8 \times (4 \times 100) \\
&= 8 \times 400 \\
&= 3,200

divide by 100

8 \times 5,000 &= 8 \times (5 \times 1000) \\
&= 8 \times 5,000 \\
&= 40,000

divide by 1,000

\text{The coffee shop made } 43,440 \text{ ounces of coffee drinks in one week.}
\end{align*}
\]
Note: By reviewing multiplication of 10, 100, and 1,000, this Application Problem leads up to today’s Concept Development, which will explore division of multiples of 10, 100, and 1,000.

**Concept Development (30 minutes)**

Materials:  (S) Personal white boards

**Problem 1**

9 ÷ 3 and 90 ÷ 3

900 ÷ 3 and 9,000 ÷ 3

Display 9 ÷ 3 and 90 ÷ 3.

T: Let’s draw number disks to represent these expressions. Solve and compare your model to your partner’s.

T: Give me a number sentence for each in unit form.

S: 9 ones ÷ 3 = 3 ones. 9 tens ÷ 3 = 3 tens.

Display 900 ÷ 3 and 9,000 ÷ 3.

T: Tell your partner how you might model these two expressions.

S: It’s just like we did for the last problems. We represented 9 disks and divided them into 3 groups. Our disks will be in the hundreds or in the thousands. We won’t have a remainder because 3 is a factor of 9.

T: Model these expressions using number disks with your partner.

S: (Draw disks and divide.)

T: What do you notice?

S: All 9 disks were split into 3 groups of 3, but they are groups of different units.

T: Write these number sentences in unit form. Turn and talk with your partner about what you notice.

S: They all look similar. → They are the same with different units. → They are all solved with 9 divided by 3; they just have different units.
Lesson 26

Lesson 26:

Divide multiples of 10, 100, and 1,000 by single-digit numbers.

Problem 2

500 \div 5
350 \div 5
3,000 \div 5

Display 500 \div 5.

T: On your board, rewrite the expression 500 \div 5 in unit form.
S: 5 hundreds \div 5.
T: Why don’t you need a pencil and paper to solve this problem?
S: Because 5 divided by 5 is 1 and the unit is hundreds so the answer is 1 hundred. \( \Rightarrow \) 5 of anything divided by 5 is 1. \( \Rightarrow \) Yeah, 5 bananas divided by 5 is 1 banana.

Display 350 \div 5.

T: Now let’s look at 350 divided by 5. Rewrite this expression in unit form. Talk to your partner about how representing this expression is different from the last one.
S: This time we have two units, hundreds and tens. \( \Rightarrow \) I can rename 3 hundreds and 5 tens as 35 tens. 35 tens divided by 5. \( \Rightarrow \) We didn’t have to decompose 5 hundreds, but now we do have to change 3 hundreds for tens since we can’t divide 3 hundreds by 5.
T: Let’s use 35 tens. Say the number sentence you will use to solve in unit form.
S: 35 tens \div 5 = 7 tens.
T: What is the quotient of 350 divided by 5?
S: 70.
T: Let’s model this on the place value chart just to be sure you really understand. Get going. Draw your 3 hundreds and 5 tens and change the hundreds into smaller units.
S: It’s true. When I decomposed each hundred I got 10 more tens. 5 tens + 10 tens + 10 tens + 10 tens is 35 tens. \( \Rightarrow \) Each 10 tens is 1 hundred.
Display $3,000 \div 5$.

T: Discuss with your partner a way to solve this problem.

T: (Allow one minute for students to discuss.) Compare your solution with a pair near you. Discuss the strategy you used.

T: (Allow time for sharing.) Is there a pair that would like to share their solution?

S: We had to decompose 3,000 into 30 hundreds because there weren’t enough thousands to divide. $\rightarrow$ 30 hundreds divided by 5 is easy because we know 30 divided by 5 is 6. Then we just had to divide 30 hundreds by 5 and got a quotient of 6 hundreds, or 600.

T: How is this problem related to $350 \div 5$?

S: 3 hundreds got changed for 30 tens, and 3 thousands got changed for 30 hundreds. $\rightarrow$ In both problems we had to change 3 larger units for 30 of the next smaller units. $\rightarrow$ It’s like when we are subtracting and we don’t have enough units, we have to change a larger unit for smaller units, too.

T: Good connections.

T: Turn and restate the ideas of your peers to your partner in your own words.

T: (Allow time for talk.) Let me fire some quick problems at you. Tell me the first expression you would solve. For example, if I say $250 \div 2$, you say 2 hundreds divided by 2. If I say $250$ divided by 5, you say 25 tens $\div 5$. Ready?

Give the students a sequence of problems such as the following:

120 $\div 2$; 400 $\div 2$; 6,200 $\div 2$; 1,800 $\div 2$; 210 $\div 3$; 360 $\div 3$; 1,200 $\div 3$; 4,200 $\div 3$.

**Problem 3**

Display: The Hometown Hotel has a total of 480 guest rooms. That is 6 times as many rooms as the Travelers Hotel down the street. How many rooms are there in the Travelers Hotel?

T: Let’s read this problem together. Draw a tape diagram to model this problem. When you have drawn and labeled your diagram, compare it with your partner’s.

T: How can we determine the value of 1 unit? (Point to the unit representing the number of rooms at the Travelers Hotel.)
Lesson 26

Divide multiples of 10, 100, and 1,000 by single-digit numbers.

Student Debrief (13 minutes)

Lesson Objective: Divide multiples of 10, 100, and 1,000 by single-digit numbers.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- Why is writing the number sentence in unit form helpful for solving problems like Problem 1?
- How did you rename the numbers in Problem 2(b) and 2(c) to divide?
- How are Problems 3(a) and 3(e) alike? How are they different?
- Explain to your partner how to solve Problem 3(g). How can you start dividing in the hundreds when there aren’t enough hundreds to divide?
- How are the tape diagrams different for Problem 4 and Problem 5? How could multiplication be used to solve these problems?
- How did the Application Problem connect to today’s lesson?

**Exit Ticket (3 minutes)**

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.
Lesson 26 Problem Set

Name ____________________________________________ Date _________________________

1. Draw number disks to represent the following problems. Rewrite each in unit form and solve.
   a. 6 ÷ 2 = ________
      6 ones ÷ 2 = ________ ones

   b. 60 ÷ 2 = ________
      6 tens ÷ 2 = _____________

   c. 600 ÷ 2 = ________
      _______________ ÷ 2 = _______________

   d. 6,000 ÷ 2 = ________
      _______________ ÷ 2 = _______________

2. Draw number disks to represent each problem. Rewrite each in unit form and solve.
   a. 12 ÷ 3 = ________
      12 ones ÷ 3 = ________ ones

   b. 120 ÷ 3 = ________
      _______________ ÷ 3 = _______________

   c. 1,200 ÷ 3 = ________
      _______________ ÷ 3 = _______________
3. Rewrite each in unit form. Solve for the quotient.

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<tbody>
<tr>
<td>a. 800 ÷ 2 = 400</td>
<td>b. 600 ÷ 2</td>
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<tr>
<td>8 hundreds ÷ 2 = 4 hundreds</td>
<td>c. 800 ÷ 4</td>
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<tr>
<td>d. 900 ÷ 3</td>
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<tr>
<td>e. 300 ÷ 6</td>
<td>f. 240 ÷ 4</td>
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<tr>
<td>30 tens ÷ 6 = ____ tens</td>
<td>g. 450 ÷ 5</td>
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<tr>
<td>h. 200 ÷ 5</td>
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<tr>
<td>i. 3,600 ÷ 4</td>
<td>j. 2,400 ÷ 4</td>
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<tr>
<td>36 hundreds ÷ 4 = ____ hundreds</td>
<td>k. 2,400 ÷ 3</td>
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<td>l. 4,000 ÷ 5</td>
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4. Some sand weighs 2,800 kilograms. It is divided equally between 4 trucks. How many kilograms of sand are in each truck?

5. Ivy has 5 times as many stickers as Adrian has. Ivy has 350 stickers. How many stickers does Adrian have?

6. An ice cream stand sold $1,600 worth of ice cream on Saturday, which was 4 times the amount sold on Friday. How much money did the ice cream stand collect on Friday?
Lesson 26 Exit Ticket

Name ____________________________ Date ________________

1. Rewrite each in unit form. Solve for the quotient.
   a. \(600 \div 3 = 200\)
      \[6 \text{ hundreds} \div 3 = \_ \text{ hundreds}\]
   b. \(1,200 \div 6\)
   c. \(2,100 \div 7\)
   d. \(3,200 \div 8\)

2. Hudson and 8 of his friends found a bag of pennies. There were 360 pennies which they shared equally. How many pennies did each person get?
Lesson 26 Homework

Name ________________________________  Date ________________

1. Draw number disks to represent the following problems. Rewrite each in unit form and solve.

   a. \( 6 \div 3 = \) ________

      \( 6 \text{ ones} \div 3 = \) ________ones

   b. \( 60 \div 3 = \) ________

      \( 6 \text{ tens} \div 3 = \) ___________

   c. \( 600 \div 3 = \) ________

      \( \hspace{1cm} \text{div} \hspace{0.5cm} 3 = \) ___________

   d. \( 6,000 \div 3 = \) ________

      \( \hspace{1cm} \text{div} \hspace{0.5cm} 3 = \) ___________

2. Draw number disks to represent each problem. Rewrite each in unit form and solve.

   a. \( 12 \div 4 = \) ________

      \( 12 \text{ ones} \div 4 = \) ________ones

   b. \( 120 \div 4 = \) ________

      \( \hspace{1cm} \text{div} \hspace{0.5cm} 4 = \) ___________

   c. \( 1,200 \div 4 = \) ________

      \( \hspace{1cm} \text{div} \hspace{0.5cm} 4 = \) ___________
### Lesson 26 Homework

3. Rewrite each in unit form. Solve for the quotient.

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<td>$160 \div 2$</td>
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<td>20 tens $\div 4 = ____$ tens</td>
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<td>l.</td>
<td>$3,000 \div 5$</td>
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4. A fleet of five fire engines carries a total of 20,000 liters of water. If each truck holds the same amount of water, how many liters of water does each truck carry?

5. Jamie drank 4 times as much juice as Brodie. Jamie drank 280 mL of juice. How much juice did Brodie drink?

6. A diner sold $2,400 worth of French fries in June, which was 4 times as much as it sold in May. How many dollars’ worth of French fries were sold at the diner in May?
Lesson 27

Objective: Represent and solve division problems with up to a three-digit dividend numerically and with number disks requiring decomposing a remainder in the hundreds place.

Suggested Lesson Structure

- Fluency Practice (12 minutes)
- Application Problem (5 minutes)
- Concept Development (33 minutes)
- Student Debrief (10 minutes)
- Total Time (60 minutes)

Fluency Practice (12 minutes)

- Sprint: Circle the Prime Number 4.OA.4 (8 minutes)
- Divide with Number Disks 4.NBT.1 (4 minutes)

Sprint: Circle the Prime Number (8 minutes)

Materials: (S) Circle the Prime Number Sprint

Note: This Sprint reviews content from G4–M3–Lessons 22–25.

Divide with Number Disks (4 minutes)

Materials: (S) Personal white boards

Note: This drill reviews G4–M3–Lesson 26’s Concept Development and strengthens the students’ understanding of place value’s role in the long division algorithm.

T: (Display 6 ÷ 2.) On your boards, draw number disks to represent the expression.
S: (Draw 6 ones disks and divide them into 2 groups of 3.)
T: Say the division sentence in unit form.
S: 6 ones ÷ 2 = 3 ones.

Repeat process using the following possible sequence: 60 ÷ 2, 600 ÷ 2, 6000 ÷ 2, 8 tens ÷ 2, 12 tens ÷ 3, and 12 tens ÷ 4.
Application Problem (5 minutes)

Emma takes 57 stickers from her collection and divides them up equally between 4 of her friends. How many stickers will each friend receive? Emma puts the remaining stickers back in her collection. How many stickers will Emma return to her collection?

Note: This Application Problem reviews the work with two-digit dividends in Lesson 16.

Concept Development (33 minutes)

Materials: (S) Personal white boards

Divide three-digit by one-digit numbers using number disks, regrouping in the hundreds.

Problem 1

Display $423 \div 3$.

T: Let’s find this quotient. Represent 423 on the place value chart. Tell your partner how many groups below will be needed.

S: (Draw chart with disks.) Three groups.

T: Four hundreds divided by 3. Distribute your disks and cross off what you’ve used. What is the quotient?

S: 1 hundred with a remainder of 1 hundred.

T: Tell me how to decompose the remaining 1 hundred.

S: Change 1 hundred for 10 tens.

T: Let’s decompose 1 hundred. Turn to your partner and decide together what to do next.

S: 10 tens and 2 tens makes 12 tens. Now we have 12 tens to divide by 3.

T: Why didn’t we stop when we had a remainder of 1 hundred?

S: Because 1 hundred is just 10 tens so you can keep dividing.
T: 12 tens divided by 3. What is the quotient? Distribute your disks and cross off what you’ve used.

S: 4 tens. → 4 tens distributed to each group with no remainder.

T: Does that mean we are finished?

S: No, we still have to divide the ones.

T: Do that now. Distribute and cross off your disks. 3 ones divided by 3. What is the quotient?

S: 1 one.

T: Is there any more dividing we need to do?

S: No. We have distributed all of the units from the whole.

T: Great! So, what is the quotient of 423 divided by 3? Say the whole number sentence.

S: Four hundred twenty-three divided by 3 equals 141.

Problem 2

Display 783 ÷ 3.

T: Let’s solve 783 ÷ 3 using a place value chart and long division side by side. Represent 783 in a place value chart and prepare set up for long division. (Allow students to create charts.) Starting with the largest unit, tell me what to divide.

S: We divide 7 hundreds by 3.

T: Do that on your chart. 7 hundreds divided by 3. What is the quotient?

S: 2 hundreds, with 1 hundred remaining.

T: (Record 2 hundreds. Point to the place value chart.) In your place value chart you recorded 2 hundreds three times. Say a multiplication sentence that tells that.

S: 2 hundreds times 3 equals 6 hundreds.

As students say the multiplication equation, refer to the algorithm, pointing to 2 hundreds, then the divisor, and finally, record 6 hundreds.

T: (Point to the place value chart.) We started with 7 hundreds, distributed 6 hundreds, and have 1 hundred remaining. Tell me a subtraction sentence for that.

S: 7 hundreds minus 6 hundreds equals 1 hundred.
Lesson 2: Represent and solve division problems with up to a three-digit dividend numerically and with number disks requiring decomposing a remainder in the hundreds place.

As students say the subtraction sentence, refer to the algorithm, pointing to the hundreds column, recording a subtraction line and symbol, and 1 hundred in the quotient.

T: (Point to the place value chart.) How many tens remain to be divided?
S: 8 tens.
T: (Record an 8 next to the 1 hundred remainder.) We decompose the remaining 1 hundred for 10 tens, and added on the 8 tens. Decompose the 1 hundred. Say a division sentence for how we should distribute 18 tens.
S: 18 tens divided by 3 equals 6 tens.

As students say the division sentence, refer to the algorithm, pointing to the 18 tens, the divisor, and then record 6 tens in the quotient. Likewise, distribute the 18 tens in the place value chart.

T: (Point to the place value chart.) You recorded 6 tens, three times. Say a multiplication sentence that tells that.
S: 6 tens times 3 equals 18 tens.

As students say the multiplication equation, refer to the algorithm, pointing to 6 tens, then the divisor, and finally, record 18 tens.

T: (Point to the place value chart.) We renamed 10 tens, distributed all 18 tens, and have no tens remaining. Say a subtraction sentence for that.
S: 18 tens minus 18 tens equals 0 tens.

As students say the subtraction equation, refer to the algorithm, record a subtraction line and symbol, and 0 tens.

T: What is left to distribute?
S: The ones.
T: (Point to the place value chart.) How many ones remain to be divided?
S: 3 ones.
T: (Record a 3 next to the 0 in the tens column.) Say a division sentence for how we should distribute 3 ones.
S: 3 ones divided by 3 equals 1 one.
As students say the division sentence, refer to the algorithm, pointing to the 3 ones, the divisor, and then record 1 ones in the quotient.

T: (Point to the place value chart.) You recorded 1 ones, three times. Say a multiplication sentence that describes that.

S: 1 one times 3 equals 3 ones.

As students say the multiplication equation, refer to the algorithm, pointing to 1 one, then the divisor, and finally, record 3 ones.

T: (Point to the place value chart.) We have 3 ones, and we distributed 3 ones. Say a subtraction sentence for that.

S: 3 ones minus 3 ones equals 0 ones.

Have students share with a partner how the model matches the algorithm. Note that both show equal groups and how both can be used to check their work using multiplication.

**Problem 3**

Display $546 \div 3$.

T: Work together with a partner to solve $546 \div 3$, using number disks and long division. One partner solves the problem using a place value chart and disks, while the other partner uses long division. Work at the same pace, matching the action of the disks with the written method, and, of course, compare your quotients.

Circulate as students are working to offer assistance as needed.

T: How was this problem unlike the others we solved today?

S: There were more hundreds left after we distributed them. We had to decompose 2 hundreds this time.
Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

Lesson Objective: Represent and solve division problems with up to a three-digit dividend numerically and with number disks requiring decomposing a remainder in the hundreds place.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- Think about ways to connect the division problems in 1(a) and 1(b) to word problems. What are some other ways to say “divided by two”? Try making a connection to fractions by using words like half.
- Problems 1(c) and 1(d) have the same divisor. Problem 1(d) has a larger whole. What conclusions can you make about quotients when the wholes are different, but the divisors are the same?
- The size of a remainder is closely connected with that of the divisor.
  - What conclusions can you make about remainders, whether they are in the hundreds, tens, or ones columns? Use Problems 2(a) and 2(b) to discuss your findings.
  - Imagine your partner found a remainder of 4 hundreds in Problem 2(b). How could you explain to them their mistake? Is there a connection with the remainder and the divisor that would help them to avoid this miscalculation in the future?
- In Problem 2(c) you had to decompose 2 hundreds into 20 tens. What did you find challenging about representing that using number disks? Did it take a while to draw that many chips? Is there a model that would simplify that process? When is it more efficient to just imagine the chips and do the long division?
- What changed when we moved from dividing two-digit wholes to three-digit wholes? Would the same process we’re using for three-digit wholes work for four-digit wholes? Five-digits? Six-digits? A million digits?
- How did the Application Problem connect to today’s lesson?

**Exit Ticket (3 minutes)**

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.
Lesson 2: Represent and solve division problems with up to a three-digit dividend numerically and with number disks requiring decomposing a remainder in the hundreds place.

Date: 8/28/13

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Lesson 27: Represent and solve division problems with up to a three-digit dividend numerically and with number disks requiring decomposing a remainder in the hundreds place.

Date: 8/28/13

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Lesson 27 Problem Set 4.3

Name ___________________________ Date ________________

1. Divide. Use number disks to model each problem.

a. $324 \div 2$

b. $344 \div 2$

c. $483 \div 3$

d. $549 \div 3$
2. Model using number disks and record using the algorithm.

<table>
<thead>
<tr>
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<th>Algorithm</th>
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<td>a.</td>
<td>$655 \div 5$</td>
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<tr>
<td>b.</td>
<td>$726 \div 3$</td>
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<tr>
<td>c.</td>
<td>$688 \div 4$</td>
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</table>
Divide. Use number disks to model each problem. Then solve using the algorithm.

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<tr>
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<th>Number Disks</th>
<th>Algorithm</th>
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<tbody>
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<td>1.</td>
<td>423 ÷ 3</td>
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<tr>
<td>2.</td>
<td>564 ÷ 4</td>
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</tbody>
</table>
1. Divide. Use number disks to model each problem.

   a. 346 ÷ 2

   b. 528 ÷ 2

   c. 516 ÷ 3

   d. 729 ÷ 3
2. Model using number disks and record using the algorithm.

<table>
<thead>
<tr>
<th></th>
<th>Model using number disks and record using the algorithm.</th>
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<tbody>
<tr>
<td>a.</td>
<td>648 ÷ 4&lt;br&gt;Number Disks</td>
</tr>
<tr>
<td>b.</td>
<td>655 ÷ 5&lt;br&gt;Number Disks</td>
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<tr>
<td>c.</td>
<td>964 ÷ 4&lt;br&gt;Number Disks</td>
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</table>
Lesson 28

Objective: Represent and solve three-digit dividend division with divisors of 2, 3, 4, and 5 numerically.

Suggested Lesson Structure

- Fluency Practice (15 minutes)
- Application Problem (6 minutes)
- Concept Development (30 minutes)
- Student Debrief (9 minutes)

Total Time (60 minutes)

Fluency Practice (15 minutes)

- Multiply by Units 4.NBT.1 (4 minutes)
- Divide Different Units 4.NBT.1 (4 minutes)
- Group Count 4.NBT.1 (3 minutes)
- Divide Three-Digit Numbers by 2 4.NBT.6 (4 minutes)

Multiply by Units (4 minutes)

Materials: (S) Personal white boards

Note: This fluency reviews G4–M3–Lesson 4.

T: (Project area model of 3 tens × 1. Beneath it, write 3 tens × 1.) Say the number sentence in unit form.

S: 3 tens × 1 = 3 tens.

T: (Write 3 tens × 1 = 3 tens.) Write the number sentence in standard form.

S: 30 × 1 = 30.

T: (Beneath 3 tens × 1 = 3 tens, write 30 × 1 = 30. Project area model of 3 tens × 1 ten. Beneath it, write 3 tens × 1 ten.) Say the number sentence in unit form.

S: 3 tens × 1 ten = 3 hundreds.

T: (Write 3 tens × 1 ten = 3 hundreds.) Write the number sentence in standard form.
S: 30 × 10 = 300.
T: (Beneath 3 tens × 1 ten = 3 hundreds, write 30 × 10 = 300. Project area model of 3 tens × 2 tens. Beneath it, write 3 tens × 2 tens.) Say the number sentence in unit form.
S: 3 tens × 2 tens = 6 hundreds.
T: (Write 3 tens × 2 tens = 6 hundreds.) Write the number sentence in standard form.
S: 30 × 20 = 600.
T: Beneath 3 tens × 2 tens = 6 hundreds, write 30 × 20 = 600.

Continue with the following possible sequence: 3 tens × 3 tens, 3 tens × 5 tens, 2 tens × 1, 2 tens × 1 ten, 2 tens × 2 tens, 2 tens × 4 tens, and 3 tens × 4 tens.

Divide Different Units (4 minutes)

Materials: (S) Personal white boards

Note: This fluency reviews G4–M3–Lesson 26’s Concept Development.

\[
\begin{align*}
8 \div 2 &= 4 \\
80 \div 2 &= 40 \\
800 \div 2 &= 400 \\
8000 \div 2 &= 4000
\end{align*}
\]

T: (Write 8 ÷ 2 = ____.) Say the division sentence in unit form.
S: 8 ones ÷ 2 = 4 ones.
T: (Write 8 ÷ 2 = 4. To the right, write 80 ÷ 2 = ____.) Say the division sentence in unit form.
S: 8 tens ÷ 2 = 4 tens.
T: (Write 80 ÷ 2 = 40. To the right, write 800 ÷ 2 = ____.) Say the division sentence in unit form.
S: 8 hundreds ÷ 2 = 4 hundreds.
T: (Write 800 ÷ 2 = 400. To the right, write 8000 ÷ 2 = ____.) Say the division sentence in unit form.
S: 8 thousands ÷ 2 = 4 thousands.
T: (Write 8000 ÷ 2 = 4000.)
T: (Write 6 tens ÷ 2 = ____.) On your boards, write the division sentence in standard form.
S: (Write 60 ÷ 2 = 30.)

Continue using the following possible sequence: 15 tens ÷ 5, 12 hundreds ÷ 3, 28 hundreds ÷ 4, 21 tens ÷ 3, 36 tens ÷ 4, 20 tens ÷ 5, and 30 hundreds ÷ 5.

Group Count (3 minutes)

Note: This drill prepares students to divide with remainders during G4–M3–Lesson 30’s Concept Development.

Direct students to count forward and backward, occasionally changing the direction of the count.

- Sixes to 60
- Sevens to 70
- Eights to 80
- Nines to 90
Divide Three-Digit Numbers by 2 (4 minutes)

Materials:  (S) Personal white boards

Note: This fluency reviews G4–M3–Lesson 27’s Concept Development.

T:  (Write $546 \div 2$.) Show $546 \div 2$ by drawing number disks in two different groups.
S:  (Do so.)
T:  Solve the same problem using the algorithm.
S:  (Do so.)

Repeat the process using the following possible suggestions: $368 \div 2$ and $846 \div 2$.

Application Problem (6 minutes)

Use $846 \div 2$ to write a word problem. Then draw an accompanying tape diagram.

Note: This Application Problem connects G4–M3–Lesson 27’s halving discussion in the Debrief. It also reinforces the use of inverse operations to check calculations. It uses the division problem from the fluency activity Divide Three-Digit Numbers. Encourage students to revise their word problem to use the word half.

Concept Development (30 minutes)

Materials:  (S) Personal white boards

Problem 1

$297 \div 4$

T:  Divide 2 hundreds by 4.
S:  There aren’t enough hundreds to put them into 4 groups. I need to break them apart.
T:  Correct. 2 hundreds is the same as how many tens?
S:  20 tens.
T: 20 tens plus 9 tens is 29 tens. Divide 29 tens by 4. What is the quotient?
S: 7 tens.
T: Where do we record 7 tens?
S: Above the 9.
T: Why?
S: Because the 9 is in the tens place. It represents the number of tens.
T: Record 7 tens. When we distribute 29 tens into 4 groups, there are 7 tens in each group. Say the multiplication sentence that tells how many of the tens were distributed.
S: 7 tens times 4 equals 28 tens.

As students are reciting the multiplication sentence, point to the 7 tens, then to the divisor, and then record the 28. Be sure students are also recording.
T: We began with 29 tens, but we distributed 28 of them. How many tens are remaining? Say the subtraction sentence that will show that.
S: 29 tens minus 28 tens equals 1 ten.
T: Continue dividing with your partner.

Allow time for students to divide.
T: What is the quotient and the remainder?
S: The quotient is 74 and the remainder is 1.
T: How can we use multiplication to check if our quotient is correct?
S: We can multiply 74 by 4, and then add the remainder 1. If we get 297 then we are correct.
T: Check our quotient using multiplication.
T: What was the new complexity for this division problem?
S: We didn’t have enough hundreds to divide, so we decomposed them as tens and divided by tens first.
Lesson 2

Problem 2

How many weeks are in one year?

T: What do we need to know in order to solve this problem?
S: The number of days in one year.
T: How many days are in one year?
T: Good! Let’s use 365 days. What other information is necessary?
S: There are 7 days in a week.
T: Ok, use a tape diagram to represent this problem. Show your partner how you set up your tape diagram, then solve it and check your work.

Allow students time to work independently. Circulate and offer assistance as necessary.

T: Did you find that 365 could be divided by 7 evenly?
S: No, there was a remainder of 1.
T: In this problem, what does the remainder mean?
S: It means that there is one extra day.
T: Talk to your partner. How did you know it was an extra day?
S: Our whole, or total, represented the number of days in a year, 365. So our remainder is days. → 365 minus 52 groups of 7 leaves 1 day remaining. → 1 one is one day. 365 ones, or days, is one year.
T: So, what would be a good sentence to write?
S: We can say, “There are 52 weeks and 1 day in one year.”

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.
**Student Debrief (9 minutes)**

**Lesson Objective:** Represent and solve three-digit dividend division with divisors of 2, 3, 4, and 5 numerically.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- Look at all of the problems with 4 as a divisor. They all have a remainder of 1, 2, or 3. If you were dividing by 4 and came up with a remainder of 4, 5, or 6, what would you know?
- Problems 1(a) and 1(b) have the same quotient. How can the same quotient come from two different whole amounts? Let’s draw a tape diagram for each to show how that could be true.
- Problems 1(c) and 1(d) have the same whole. Which quotient is larger? Why?
- How did the Application Problem connect to today’s lesson?

**Exit Ticket (3 minutes)**

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.
Lesson 28 Problem Set

<table>
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<th>Date</th>
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1. Divide. Check your work by multiplying. Draw disks on a place value chart as needed.

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<td>a. $574 \div 2$</td>
<td>b. $861 \div 3$</td>
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<tr>
<td>c. $354 \div 2$</td>
<td>d. $354 \div 3$</td>
</tr>
<tr>
<td>e. $873 \div 4$</td>
<td>f. $591 \div 5$</td>
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</table>
2. Zach filled 581 one-liter bottles with apple cider. He distributed the bottles evenly to 4 stores. How many liter bottles did each of the stores receive? Were there any bottles left over? If so, how many?

g. $275 \div 3$

h. $459 \div 5$

i. $678 \div 4$

j. $955 \div 4$
Name ____________________________ Date ________________

1. Divide. Check your work by multiplying. Draw disks on a place value chart as needed.
   a. \(776 \div 2\)       b. \(596 \div 3\)

2. A carton of milk contains 128 ounces. Sara’s son drinks 4 ounces of milk at each meal. How many 4-ounce servings will one carton of milk provide?
1. Divide. Check your work by multiplying. Draw disks on a place value chart as needed.

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<tbody>
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<td>378 ÷ 2</td>
<td>795 ÷ 3</td>
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<tr>
<td>c.</td>
<td>d.</td>
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<tr>
<td>512 ÷ 4</td>
<td>492 ÷ 4</td>
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<tr>
<td>e.</td>
<td>f.</td>
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<tr>
<td>539 ÷ 3</td>
<td>862 ÷ 5</td>
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</table>
2. Selena’s dog completed an obstacle course that was 932 meters long. There were 4 parts to the course, all equal in length. How long was 1 part of the course?

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<thead>
<tr>
<th>g. 498 ÷ 3</th>
<th>h. 783 ÷ 5</th>
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<tbody>
<tr>
<td>i. 621 ÷ 4</td>
<td>j. 531 ÷ 4</td>
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Lesson 29

Objective: Represent numerically four-digit dividend division with divisors of 2, 3, 4, and 5, decomposing a remainder up to three times.

Suggested Lesson Structure

- Fluency Practice (12 minutes)
- Application Problem (5 minutes)
- Concept Development (33 minutes)
- Student Debrief (10 minutes)
- Total Time (60 minutes)

Fluency Practice (12 minutes)

- Multiply by Units 4.NBT.1 (4 minutes)
- Divide Different Units 4.NBT.1 (4 minutes)
- Divide to Find Half 4.NBT.6 (4 minutes)

Multiply by Units (4 minutes)

Materials: (S) Personal white boards

Note: This fluency reviews G4–M3–Lesson 4.

T: (Write 2 × 4 = ___.) Say the multiplication sentence in unit form.
S: 2 ones × 4 = 8 ones.
T: Write the equation in standard form.
S: 2 × 4 = 8.
T: (Write 20 × 4 = ___.) Say the multiplication sentence in unit form.
S: 2 tens × 4 = 8 tens.
T: Write the equation in standard form.
S: 20 × 4 = 80.
T: (Write 2 tens × 4 tens = ___.) Say the multiplication sentence in unit form.
S: 2 tens × 4 tens = 8 hundreds.
T: Write the equation in standard form.
S: 20 × 40 = 800.
Continue with the following possible sequence: \( 3 \times 3, 30 \times 3, 30 \times 30, 30 \times 40, 5 \times 3, 50 \times 3, 50 \times 30, 50 \times 50, 5 \times 8, 50 \times 8, \) and \( 50 \times 80. \)

**Divide Different Units (4 minutes)**

**Materials:** (S) Personal white boards

**Note:** This fluency reviews G4–M3–Lesson 26’s Concept Development and strengthens the students’ understanding of place value’s role in the long division algorithm.

Repeat the process from G4–M3–Lesson 28 using the following possible suggestions: 9 ones ÷ 3, 9 tens ÷ 3, 9 hundreds ÷ 3, 9 thousands ÷ 3, 16 tens ÷ 4, 15 hundreds ÷ 5, 27 hundreds ÷ 3, 24 tens ÷ 3, 32 tens ÷ 4, 40 tens ÷ 5, and 20 hundreds ÷ 5.

**Divide to Find Half (4 minutes)**

**Materials:** (S) Personal white boards

**Note:** This fluency reviews G4–M3–Lesson 28’s Concept Development.

- T: Find half of 38 using long division.
  - S: 19.

- T: Find half of 386.
  - S: 193.

Continue with the following possible sequence: half of 56, 562, 74, and 744.

**Application Problem (5 minutes)**

Janet uses 4 feet of ribbon to decorate each pillow. The ribbon comes in 225-foot rolls. How many pillows will she be able to decorate with one roll of ribbon? Will there be any ribbon left over?

**Note:** This Application Problem reviews the skill of decomposing units in order to divide and interpreting a remainder within the context of a word problem, so that those skills may be applied to today’s work with four-digit dividends.

Janet can make 56 pillows from 1 roll of ribbon, and she will have 1 foot of ribbon left over.
Concept Development (33 minutes)

Materials: (S) Personal white boards.

Problem 1
Solve $4,325 \div 3$ using the standard algorithm. Multiply to check the answer.

T: Divide 4 thousands by 3. What is the quotient?
S: 1 thousand.
T: Record 1 thousand. Say the multiplication sentence that tells how many of the thousands we distributed.
S: 1 thousand times three equals 3 thousands.
As students are reciting the multiplication sentence, point to the thousand, then to the divisor, and then record the 3 in the thousands column. Be sure students are also recording.
T: We began with 4 thousands, and distributed 3 of them. How many thousands remain? What is the subtraction sentence that will show that?
S: 4 thousands minus 3 thousands equals 1 thousand.
As students are reciting the subtraction sentence, point to the 4 thousands, the 3 thousands, and then record the remaining 1.
T: What do you notice when we subtracted?
S: We have 1 thousand left that we can decompose into 10 hundreds.
T: How many hundreds did we already have?
S: 3 hundreds. Now our division sentence for the hundreds is 13 hundreds divided by 3. 13 hundreds divided by 3 is 4 hundreds.
T: Record 4 hundreds. Continue dividing with your partner.
Allow time for students to complete the long division.
T: Say the complete division sentence.
S: 4,325 divided by 3 is 1,441 with a remainder of 2.
T: Great! How can we use multiplication to check if our quotient and remainder are correct?
S: We can multiply 1,441 by 3 and then add the remainder of 2.
Repeat with 2,254 ÷ 3. Use the standard algorithm and multiply to check the answer. (Students see 22 hundreds ÷ 3 is the first step instead of 2 thousands ÷ 3.)

Problem 2
Ellie bought two packs of beads. Altogether she has 1,254 beads. If the number of beads in each bag is the same, how many beads are in three packs?

T: Draw something to help you solve this problem. (Pause.) What did you draw?
S: (Method A) I drew a tape diagram. I made 2 units and labeled the whole as 1,254 since we know that there are 1,254 beads in two packs. Then I just drew a third unit. I labeled all 3 units with a question mark to represent how many beads are in three packs.
S: (Method B) Not me, after I drew two equal parts, I drew a second tape diagram below with three equal parts.

T: What conclusions did you make from your drawing?
S: We need to divide 1,254 by 2 to find out how many beads are in each bag. This helped because if we know how many beads are in one bag, we can multiply by 3 to find out how many beads are in three bags.

T: 1,254 divided by 2 is?
S: 1,254 divided by 2 is 627.
T: Was that the end?
S: No! We needed to multiply 627 by 3 to find the total number of beads in three packs.
S: 627 times 3 equals 1,881. There are 1,881 beads in three packs.

Note: Clearly this is scripted to reflect a classroom where the students have confidence with the tape diagram. If students need a more guided approach that should be provided.
Lesson 29  4.3

Problem Set  (20 minutes)

Students should do their personal best to complete the Problem Set within the allotted 20 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.

Student Debrief  (10 minutes)

Lesson Objective: Represent numerically four-digit dividend division with divisors of 2, 3, 4, and 5, decomposing a remainder up to three times.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson. You may choose to use any combination of the questions below to lead the discussion.

- All of the problems in the Problem Set divided a four-digit number by a one-digit number. Why do some of the quotients contain three digits while others have four?
- What did you notice about the size of the quotient in Problems 1(e) and 1(f), when the divisor increased from 2 to 3?
- Problems 1(i) and 1(j) resulted in the same quotient. Explain why that is possible.
- When is it possible for you to know, before dividing, whether or not a division problem will have a remainder?
- We have divided two-, three-, and now four-digit numbers. Explain to your partner how each time the whole became larger, another step was added. Discuss what you think would be true for dividing a number with a greater number of digits.
Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.
1. Divide, then check using multiplication.

   a. 1,672 ÷ 4
   b. 1,578 ÷ 4
   c. 6,948 ÷ 2
   d. 8,949 ÷ 4
   e. 7,569 ÷ 2
   f. 7,569 ÷ 3
### Lesson 29 Problem Set

#### 2. There are twice as many cows as goats on a farm. All the cows and goats have a total of 1,116 legs. How many goats are there?

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<td>g. $7,955 \div 5$</td>
<td>h. $7,574 \div 5$</td>
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<tr>
<td>i. $7,469 \div 3$</td>
<td>j. $9,956 \div 4$</td>
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</table>
1. Divide, then check using multiplication.

   a. \( 1,770 \div 3 \)
   
   b. \( 8,470 \div 5 \)

2. The post office had an equal number of each of 4 types of stamps. There were a total of 1,784 stamps. How many of each type of stamp did the post office have?
1. Divide, then check using multiplication.

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<td>a. 2,464 ÷ 4</td>
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<td>c. 9,426 ÷ 3</td>
<td>d. 6,587 ÷ 2</td>
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<td>e. 5,425 ÷ 3</td>
<td>f. 5,425 ÷ 2</td>
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Lesson 29 Homework

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<th>8,427 ÷ 3</th>
<th>h.</th>
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<td>i.</td>
<td>4,937 ÷ 4</td>
<td>j.</td>
<td>6,173 ÷ 5</td>
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2. A truck has four crates of apples. Each crate has an equal number of apples. Altogether, the truck is carrying 1,728 apples. How many apples are in three crates?
Lesson 30

Objective: Solve division problems with a zero in the dividend or with a zero in the quotient.

Suggested Lesson Structure

- Fluency Practice (12 minutes)
- Application Problem (5 minutes)
- Concept Development (33 minutes)
- Student Debrief (10 minutes)
- Total Time (60 minutes)

Fluency Practice (12 minutes)

- Multiply Using the Standard Algorithm 4.NBT.5 (4 minutes)
- Divide Different Units 4.NBT.1 (4 minutes)
- Find the Quotient and Remainder 4.NBT.6 (4 minutes)

Multiply Using the Standard Algorithm (4 minutes)

Materials: (S) Personal white boards

Note: This fluency drill will review Concept Development from G4–M3–Lessons 10 and 11 in anticipation of Topic H.

T: (Write 773 × 2 = ___.) On your boards, find the product using the standard algorithm.

Repeat for process for possible sequence: 147 × 3, 1,605 × 3, and 5,741 × 5.

Divide Different Units (4 minutes)

Materials: (S) Personal white boards

Note: This drill reviews G4–M3–Lesson 26’s Concept Development and strengthens students’ understanding of place value’s role in the long division algorithm.

Repeat the process from G4–M3–Lessons 28 and 29 using the following possible sequence: 15 ones ÷ 3, 15 tens ÷ 3, 25 hundreds ÷ 5, 21 hundreds ÷ 3, 28 tens ÷ 4, 30 tens ÷ 5, and 40 hundreds ÷ 5.
Find the Quotient and Remainder (4 minutes)

Materials: (S) Personal white boards

Note: This fluency reviews G4–M3–Lesson 29’s Concept Development.

T: (Write 4,768 ÷ 2.) On your boards, find the quotient and remainder.
S: (Do so.)
Continue with the following possible sequence: 6,851 ÷ 5, 1,264 ÷ 4, and 1,375 ÷ 4.

Application Problem (5 minutes)

The store wanted to put 1,455 bottles of juice into packs of four. How many complete packs can they make? How many more bottles do they need to make another pack?

Note: This problem is a review of Lesson 29, which bridges dividing with remainders to the current lesson.

Concept Development (33 minutes)

Materials: (S) Personal white boards

Problem 1
804 ÷ 4

T: What is our first step to divide 804 by 4?
S: Divide the hundreds place. → Divide the largest units by 4.
T: 8 hundreds divided by 4 is?
S: 2 hundreds.
T: Say a multiplication sentence that tells how many hundreds have been distributed starting with 2 hundreds.
S: 2 hundreds times 4 equals 8 hundreds.
T: Tell your partner how to find how many hundreds remain.

S: 8 hundreds minus 8 hundreds is 0 hundreds. 0 hundreds remain.

T: Zero hundreds remain. If zero hundreds remain, we can’t decompose hundreds into tens to keep dividing. Are we finished?

S: If there are no more hundreds to regroup as tens, I guess we are finished. → Even if we had hundreds to regroup, there aren’t any tens to regroup with. → There are still 4 ones. We have to divide those.

T: Can we move straight to dividing in the ones column? Discuss with your partner what happens if we just pass by the tens since there are zero tens.

S: We have to divide all of the units in the whole, so yeah, let’s divide 4 ones by 4. → If we do that, we record 1 one in the ones column, but then we have nothing to record in the tens column because we skipped it. → Our answer could be 21. But if I multiply 21 times 4, that’s 84, and the whole is 804. → We have to keep dividing in the tens, even if there are zero tens to divide, otherwise our answer will be wrong.

T: Yes, we must keep dividing unit by unit, even if there is a zero in a unit. Zero hundreds renamed as tens is zero tens. Zero tens plus zero tens is zero tens. What is zero tens divided by 4?

S: Zero tens.

T: We continue recording even if we have zero tens to regroup. Zero tens times 4 is?

S: Zero tens.

T: Zero minus zero is zero. 4 ones remain. Work with your partner to find the quotient.

S: (Continue dividing until they reach the quotient of 201.)

T: Say the complete equation.

S: 804 divided by 4 equals 201.

T: Check your work using multiplication.

S: 201 times 4 equals 804.

T: Tell your partner how you know when to stop dividing?

S: Where there are no more remainders, you are finished. → You must keep dividing in each place value, even if there are zero remainders or a zero in the whole. → Keep dividing until each place value has been divided. Once you divide the ones, you have a quotient and possibly a remainder. → You must keep dividing the smaller units even if you don’t have any larger units to divide.
Lesson 30: Solve division problems with a zero in the dividend or with a zero in the quotient.

Date: 8/28/13

Problem 2

4,218 ÷ 3

T: Work with your partner to divide the thousands and the hundreds. As I circulate around the room, let me hear you using the language of units as you divide.

Allow students one to two minutes to divide. Have two students come to the board to show their work.

T: I see that these students have found the quotient contains 1 thousand and 4 hundreds. When they subtracted the distributed hundreds, there was no remainder. We don’t need to rename zero hundreds as tens, but we do have 1 ten to divide. Discuss with your partner your next steps.

S: 1 ten cannot be divided by 3. I’m not sure what to do. → But 10 divided by 3 would give me a quotient of 3. → But that’s 3 ones, not 3 tens. → If I divided 1 ten into 3 groups, I would distribute zero tens if I was using disks, so the answer is zero tens. We should record zero tens in our quotient.

T: Right! If we distribute zero tens we record zero in the quotient and still have 1 ten and 8 ones remaining. Talk with your partner about your next steps.

S: We can change 1 ten for 10 ones. Now we have 18 ones divided by 3 is 6 ones. Our quotient is 1,406.

T: Talk with your partners about the importance of the zero in your quotient.

S: If I didn’t record the zero, my answer would be wrong. → The zero is a place holder of the tens. I can’t leave that place empty. Or, what if I tried recording the 6 ones in the tens place? Then my answer would really be wrong! → I can always use multiplication or estimation to check my work in case I may have recorded wrong.

Problem Set (20 minutes)

Students should do their personal best to complete the Problem Set within the allotted 20 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.
Lesson 30

Student Debrief (10 minutes)

Lesson Objective: Solve division problems with a zero in the dividend or with a zero in the quotient.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- In Problem 6, did anyone get 128? How did you know that was wrong?
- In Problem 10, the whole had consecutive zeros. How does your place value knowledge help you to keep track of where you are dividing?
- Why does multiplication help you check your division?
- For what reason might there be a zero in the quotient?
- We divide, starting with the largest unit, and see if there is a remainder. What do we do with the remaining unit or units? How is that different than what we do in the ones place?
- Normally we stop dividing at the ones place, and if there’s a remainder, we give the remainder with the quotient. What if we were dividing up money? If we got down to the ones place, using dollars, what could we do?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.
Divide. Check your solutions by multiplying.

1. $204 \div 4$

2. $704 \div 3$

3. $627 \div 3$

4. $407 \div 2$

5. $760 \div 4$

6. $5,120 \div 4$
Lesson 30 Problem Set

7. \[ 3,070 \div 5 \]  
8. \[ 6,706 \div 5 \]

9. \[ 8,313 \div 4 \]  
10. \[ 9,008 \div 3 \]

11. a. Find the quotient and remainder for \[ 3,131 \div 3 \].

b. How could you change the digit in the ones place of the whole so that there would be no remainder? Explain how you determined your answer.
Name ________________________________ Date __________________________

Divide. Check your solutions by multiplying.

1. $380 \div 4$

2. $7,040 \div 3$
Divide. Check your solutions by multiplying.

1. 409 ÷ 5
2. 503 ÷ 2
3. 831 ÷ 4
4. 602 ÷ 3
5. 720 ÷ 3
6. 6,250 ÷ 5
7. 2,060 ÷ 5
8. 9,031 ÷ 2

9. 6,218 ÷ 4
10. 8,000 ÷ 4
Lesson 31

Objective: Interpret division word problems as either number of groups unknown or group size unknown.

Suggested Lesson Structure

- Fluency Practice (11 minutes)
- Application Problem (5 minutes)
- Concept Development (34 minutes)
- Student Debrief (10 minutes)
- Total Time (60 minutes)

Fluency Practice (11 minutes)

- Sprint: Divide Different Units 4.NBT.1 (9 minutes)
- Group Size or Number of Groups Unknown 4.OA.1 (2 minutes)

Sprint: Divide Different Units (9 minutes)

Materials: (S) Divide Different Units Sprint

Note: This Sprint reviews G4–M3–Lesson 26’s Concept Development and strengthens students’ understanding of place value’s role in the long division algorithm.

Group Size or Number of Groups Unknown (2 minutes)

Note: This drill prepares students for the Concept Development.

T: 8 ÷ 2. Here are two tape diagrams representing 8 ÷ 2 = 4. (Point to the model on the left.) What does the 2 represent, the size of the group or the number of groups?

S: The size of the group!

T: (Point to the second model.) In the model to the right?

S: The number of groups.

Repeat with 12 ÷ 3 = 4.
Lesson 31

Application Problem (5 minutes)

1,624 shirts need to be sorted into four equal groups. How many shirts will be in each group?

```
4 0 6
4 1 6 2 4
4 1 6 2 4
1 6
1 6
2 4
2 4
0
0
```

Note: This problem is a review of Lesson 30, practicing with a zero in the quotient. In Problem 1, the students discuss whether the number of groups was unknown or the group size was unknown.

Concept Development (34 minutes)

Materials: (S) Personal white boards

Problem 1

Dr. Casey has 1,868 milliliters of Medicine T. She poured equal amounts of the medicine into 4 containers. How many milliliters of medicine are in each container?

T: Can you draw something to help you solve this problem? What can you draw? Go ahead and do so.

S: (Draw.)

T: What did you draw?

S: I drew a tape diagram with the whole labeled as 1,868 milliliters. → I made the whole into 4 equal parts because she poured the medicine into four containers.

T: What are we trying to find out?

S: We need to find out how many milliliters are in each container. → We need to find the size of the group.

T: Right, we are finding the size of the group. We already know how many groups there are, four.

T: Let’s label the unknown with t for Medicine T.

T: Solve for how much medicine will be in each container. (Allow time for students to work.)

S: There will be 467 milliliters in each container.

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Differentiate the difficulty of the Application Problem by adjusting the numbers.

Extend for students working above grade level with these questions:

- How or why might the shirts be sorted?
- Were you able to predict that a zero would be in the quotient? How?
Lesson 31

Interpret division word problems as either number of groups unknown or group size unknown.

Lesson 3

1: Compare this tape diagram to the one you drew in the Application Problem. Discuss the similarities. Were you solving for the number of groups, or the size of the group?

S: Both tape diagrams are broken into four groups. Both show we were solving for the size of each group.

Problem 2

T: With your partner, discuss the tape diagram. Then, create your own word problem to match. Remember to determine if you are finding the size of the group or the number of groups. (We might also express this choice as the number of measurements or the size of the measurements.)

Guide students to see the equal partitioned parts of the tape diagram tells how many groups there are. Students will need to write a problem that asks for the number in each group or the size of the measurement. Suggest the context of 168 liters of cleaning solution to be poured equally into 3 containers. Have a few sets of partners share out their word problems to verify students are writing to solve for group size unknown.

Problem 3

Two hundred thirty-two people are driving to a conference. If each car holds 4 people, including the driver, how many cars will be needed?

T: Can you draw something to help you solve this problem? Go ahead. (Pause while they draw.) What did you draw?

S: I drew a tape diagram with the whole labeled as 232 people.

T: Tell your partner how you partitioned the tape diagram. Are you finding the size of each group, or the number of groups?

S: We made 4 equal parts because each car has 4 people in it. No, we know the size of the group. Each car has 4 people. We don’t know how many groups, or how many cars. We showed that 4 are in each car, but we don’t know the number of cars. We showed that 4 are in each car, but we don’t know the number of cars. Each unit of the tape diagram shows there are 4 people in each car. But we didn’t know how many cars to draw.

T: We labeled the tape diagram to show 4 people in each car, and used a question mark to show we didn’t know how many cars were needed.
Lesson 31

Interpret division word problems as either number of groups unknown or group size unknown.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for
misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- How and why are the tape diagrams in Problems 1 and 2 different?
- Share your tape diagrams for Problem 3. What led you to draw a tape diagram to solve for the number of groups?
- For Problem 3, if our tape diagram shows the whole divided into 3 equal groups instead, would we get the wrong quotient?
- Compare your tape diagrams for Problem 2 and Problem 4. Describe how your tape diagrams differ between one- and two- step problems. If there are two unknowns, how do you determine which one to solve first?
- If for Problem 5 the tape diagram was drawn to show groups of 5, instead of 5 equal groups, how might that lead to challenges when solving the second part of the problem?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.
### Lesson 31 Sprint

**A**

Divide.

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Lesson 31 Sprint

Lesson 31: Interpret division word problems as either number of groups unknown or group size unknown.

Date: 8/28/13

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<td>120 ÷ 3 =</td>
<td>41</td>
</tr>
<tr>
<td>20</td>
<td>1200 ÷ 3 =</td>
<td>42</td>
</tr>
<tr>
<td>21</td>
<td>25 ÷ 5 =</td>
<td>43</td>
</tr>
<tr>
<td>22</td>
<td>20 ÷ 5 =</td>
<td>44</td>
</tr>
</tbody>
</table>
Draw a tape diagram and solve. The first two tape diagrams have been drawn for you. Identify if the group size or the number of groups is unknown.

1. Monique needs exactly 4 plates on each table for the banquet. If she has 312 plates, how many tables is she able to prepare?

   ![Tape Diagram](image1)

2. 2,365 books were donated to an elementary school. If 5 classrooms shared the books equally, how many books did each class receive?

   ![Tape Diagram](image2)

3. If 1,503 kilograms of rice was packed in sacks weighing 3 kilograms each, how many sacks were packed?
4. Rita made 5 batches of cookies. There were a total of 2,400 cookies. If there were the same number of cookies in each batch, how many cookies were in 4 batches?

5. Every day, Sarah drives the same distance to work and back home. If Sarah drove 1,008 miles in 5 days, how far did Sarah drive in 3 days?
Solve the following problems. Draw tape diagrams to help you solve. Identify if the group size or the number of groups is unknown.

1. 572 cars were parked in a parking garage. The same number of cars parked on each floor. If there were 4 floors, how many cars were parked on each floor?

2. 356 kg of flour were packed into sacks holding 2 kg each. How many sacks were packed?
Lesson 31 Homework

Name ___________________________ Date ________________

Solve the following problems. Draw tape diagrams to help you solve. Identify if the group size or the number of groups is unknown.

1. 500 mL of juice was shared equally by 4 children. How much juice did each child get?

2. Kelly separated 618 cookies into baggies. Each baggie contained 3 cookies. How many baggies of cookies did Kelly make?

3. Jeff biked the same distance each day for 5 days. If he travelled 350 miles altogether, how many miles did he travel each day?
4. A piece of ribbon 876 inches long was cut by a machine into 4-inch long strips to be made into bows. How many strips were cut?

5. Five Martians equally share 1,940 Groblarx fruits. How many Groblarx fruits will 3 of the Martians receive?
Lesson 32

Objective: Interpret and find whole number quotients and remainders to solve one-step division word problems with larger divisors of 6, 7, 8, and 9.

Suggested Lesson Structure

- Fluency Practice (12 minutes)
- Application Problem (7 minutes)
- Concept Development (31 minutes)
- Student Debrief (10 minutes)
- Total Time (60 minutes)

Fluency Practice (12 minutes)

- Quadrilaterals 3.G.1 (4 minutes)
- Multiply Units 4.NBT.1 (4 minutes)
- Group Count 4.OA.1 (4 minutes)

Quadrilaterals (4 minutes)

Materials: (T) Shapes sheet

Note: This fluency reviews Grade 3 geometry concepts in anticipation of Module 4 content. The sheet can be duplicated for the students if you prefer.

T: (Project the quadrilaterals template and the list of attributes.) Take one minute to discuss the attributes of the shapes you see. You can use the list to support you.

S: Some have right angles. All have straight sides. They all have 4 sides. B and G and maybe H and K have all equal sides. I’m not really sure.

T: If we wanted to verify whether the sides are equal, what would we do?
S: Measure!
T: What about the angles? How could you verify that they're right?
S: I could compare it to something that I know is a right angle.
T: Now, look at the shape names. Determine to the best of your ability which shapes might fall into each category. (Post the shape names.)
S: B and G might be squares. → All of them are quadrilaterals. → H and K might be rhombuses. It’s hard to know if their sides are equal. → D and I are rectangles. Oh yeah, and B and G are, too. → L and A look like trapezoids.
T: Which are quadrilaterals?
S: All of them.
T: Which shapes appear to be rectangles?
S: B, D, G, and I.
T: Which appear to have opposite sides of equal length but are not rectangles?
S: C, H, K. → A and L have one pair of opposite sides that look the same.
T: Squares are rhombuses with right angles. Do you see any other shapes that might have four equal sides without right angles?
S: H and K.

Multiply Units (4 minutes)

Materials: (S) Personal white boards

Note: This fluency reviews G4–M3–Lesson 4’s content.

T: (Write $2 \times 4 = \_\_\_\_\_\_\_.) Say the multiplication sentence in unit form.
S: 2 ones $\times$ 4 = 8 ones.
T: Write the answer in standard form.
S: (Write 8.)

T: (Write $20 \times 4 = \_\_\_\_\_\_\_.) Say the multiplication sentence in unit form.
S: 2 tens $\times$ 4 = 8 tens.
T: Write the answer in standard form.
S: (Write 80.)

Continue with the following possible sequence: 2 hundreds $\times$ 4, 2 thousands $\times$ 4, 3 ones $\times$ 5, 3 tens $\times$ 5, 3 thousands $\times$ 5, 3 thousands $\times$ 4, 5 tens $\times$ 6, 5 ones $\times$ 4, 5 thousands $\times$ 8, and 9 tens $\times$ 6.

Group Count (4 minutes)

Note: This drill prepares students for this lesson’s Concept Development.

Direct students to count forward and backward, occasionally changing the direction of the count.

- Sixes to 60
- Sevens to 70
Lesson 3

- Eights to 80
- Nines to 90

Application Problem (7 minutes)

Use the tape diagram to create a division word problem that solves for the unknown, the total number of threes in 4,194. Switch word problems with a partner and solve.

4,194 pounds
\[ \frac{3}{\ldots ? \ldots} \]

A mill produces 4,194 pounds of flour. If they pack the flour in 3 pound sacks, how many sacks of flour can they make?

\[
\begin{array}{c|c}
3 & 4,194 \\
- & \underline{3} \\
\hline
1 & 194 \\
- & \underline{9} \\
\hline
11 & 27 \\
- & \underline{24} \\
\hline
3 & 0 \\
\end{array}
\]

Note: This problem extends understanding from G4–M3–Lesson 31 about solving for an unknown number of groups. Extend this problem in the Debrief using a divisor of 6, which connects to this lesson’s Concept Development.

Concept Development (31 minutes)

Materials: (S) Personal white boards

Problem 1

We all know there are 7 days in a week. How many weeks are in 259 days?

T: Draw what we know and what we need to know on a tape diagram.

S: I labeled the whole as 259 days. Then I put a 7 in one part because there are 7 days in each week. We don’t know how many groups of 7 days there are.

T: How did you represent the number of weeks that are unknown?

S: I labeled the rest of the tape diagram with a question mark.

T: Solve for how many weeks there are in 259 days.
S: There are 37 weeks in 259 days.

T: The divisor in this problem is larger than many division problems we have solved. Tell your partner a strategy you can use to find the quotient when dividing by 7.

S: 25 tens divided by 7 is easy. It’s 3 tens with 4 tens left over. \(\Rightarrow\) I counted by sevens, 10 at a time: 10 sevens is 70, 20 sevens is 140, 30 sevens is 210, and 40 sevens would be too big. So I got 30 sevens with 49 left over. \(\Rightarrow\) That’s still means you get 3 tens in the quotient. One way is like we did with the chip model. The other is like we did with the area model. But they’ll both give the same answer.

T: Either way of thinking will work for finding the quotient. When our divisor is large, how do I check to see if my quotient and remainder are correct?

S: The same way we always do! \(\Rightarrow\) It’s no different for big divisors than for small divisors—multiply the number of groups times the size of each group. \(\Rightarrow\) And don’t forget to add the remainder. \(\Rightarrow\) Multiply the divisor by the quotient and add the remainder.

T: So what we learned about small divisors still helps us now!

**Problem 2**

Everyone is given the same number of colored pencils in art class. If there are 249 colored pencils and 8 students, how many pencils does each student receive?

T: Draw a tape diagram to represent the problem. Describe the parts of your tape diagram to your partner.

S: I recorded and labeled the total of 249 pencils. Then I made 8 equal parts because there are 8 students. I need to solve for how many in each group, so I put a question mark in one part to show that I need to solve for how many pencils each student will get.

T: Solve for how many pencils each student will receive. (Allow students time to work.)

S: Each student will receive 31 colored pencils. There will be 1 pencil left over.

T: Discuss a strategy you might have used when dividing by a larger divisor, like 8.

S: I counted by 8 tens. 8 tens, 16 tens, 24 tens. \(\Rightarrow\) I know there are 2 fours in each eight. There are 6 fours in 24. So half of 6 is 3. There are 3 eights in 24. \(\Rightarrow\) I used my facts. I know 8 times 3 tens is 24 tens.
Lesson 3

Problem 3

Mr. Hughes has 155 meters of volleyball netting. How many nets can he make if each court requires 9 meters of netting?

T: Draw a tape diagram to represent the problem. Describe the parts of your tape diagram to your partner.

S: My tape diagram shows a total of 155 and I partitioned one section for 9 meters. I don’t know how many nets he can make, but I do know the length of each.

T: Solve for how many nets can be made using long division.

S: 17 nets can be made, but 2 meters of netting will be left over.

T: Does your drawing of the tape diagram account for the remaining netting? Let’s revise our tape diagram to show the remainder.

S: I can add a shaded portion at the end showing the remaining 2 meters.

T: What strategy did you use for dividing with the divisor of 9?

S: I counted by 9 tens. 9 tens, 18 tens. 180 was too big. I used a special strategy. I made 10 nets, which meant I used 90 meters of netting. That left 65 meters. 9 times 7 is 63, so that meant 7 more nets and 2 meters left over. I used my nines facts.

Problem Set (15 minutes)

Students should do their personal best to complete the Problem Set within the allotted 15 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.
Lesson Objective: Interpret and find whole number quotients and remainders to solve one-step division word problems with larger divisors of 6, 7, 8, and 9.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson. You may choose to use any combination of the questions below to lead the discussion.

- In Problem 2, are you solving for the quotient, the remainder, or both? Why?
- Did you have to revise your tape diagram for any of the problems? If so, which one(s), and why?
- In Problem 4, did anyone get 15 teams were made? Why would that be an easy mistake to make?
- How could a special strategy be used to solve Problem 1?
- How did yesterday’s lesson prepare you for solving today’s lesson?
- Revisit the Application Problem. Revise the word problems using a divisor of 6 and solve. Compare the quotients. Do you see a relationship between the quotients? Did you need to divide 4,194 by 6 or could you have gotten the new quotient directly from the previous quotient (1,398)?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.
Lesson 32 Problem Set 4.3

Name __________________________ Date ________________

Solve the following problems. Draw tape diagrams to help you solve. If there is a remainder, shade in a small portion of the tape diagram to represent that portion of the whole.

1. A concert hall contains 8 sections of seats with the same number of seats in each section. If there are 248 seats, how many seats are in each section?

2. In one day, the bakery made 719 bagels. The bagels were divided into 9 equal shipments. A few bagels were left over and given to the baker. How many bagels did the baker get?

3. The sweet shop has 614 pieces of candy. They packed the candy into bags with 7 pieces in each bag. How many bags of candy did they fill? How many pieces of candy were left?
4. There were 904 children signed up for the relay race. If there were 6 children on each team, how many teams were made? The remaining children served as referees. How many children served as referees?

5. 1,188 kilograms of rice are divided into 7 sacks. How many kilograms of rice are in 6 sacks of rice? How many kilograms of rice remain?
Name ____________________________ Date __________

Solve the following problems. Draw tape diagrams to help you solve. If there is a remainder, shade in a small portion of the tape diagram to represent that portion of the whole.

1. Mr. Foote needs exactly 6 folders for each fourth grade student at Hoover Elementary School. If he bought 726 folders, how many students can he supply folders to?

2. Mrs. Terrance has a large bin of 236 crayons. He divides them equally among four containers. How many crayons does Mrs. Terrance have in each container?
Solve the following problems. Draw tape diagrams to help you solve. If there is a remainder, shade in a small portion of the tape diagram to represent that portion of the whole.

1. Meneca bought a package of 435 party favors to give to the guests at her birthday party. She calculated that she could give 9 party favors to each guest. How many guests is she expecting?

2. 4,000 pencils were donated to an elementary school. If 8 classrooms shared the pencils equally, how many pencils did each class receive?

3. 2,008 kilograms of potatoes were packed into sacks weighing 8 kilograms each. How many sacks were packed?
4. A baker made 7 batches of muffins. There were a total of 252 muffins. If there were the same number of muffins in each batch, how many muffins were in a batch?

5. Samantha ran 3,003 meters in 7 days. If she ran the same distance each day, how far did Samantha run in 3 days?
Lesson 32: Interpret and find whole number quotients and remainders to solve one-step division word problems with larger divisors of 6, 7, 8, and 9.

Date: 8/28/13

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Lesson 33

Objective: Explain the connection of the area model of division to the long division algorithm for three- and four-digit dividends.

Suggested Lesson Structure

- Fluency Practice (12 minutes)
- Application Problem (5 minutes)
- Concept Development (33 minutes)
- Student Debrief (10 minutes)

Total Time (60 minutes)

Fluency Practice (12 minutes)

- Quadrilaterals 3.G.1 (4 minutes)
- Group Count 4.OA.1 (4 minutes)
- Multiply Units 4.NBT.1 (4 minutes)

Quadrilaterals (4 minutes)

Materials: (T) Shape sheet from G4–M3–Lesson 32
(S) Personal white boards

Note: This fluency reviews Grade 3 geometry concepts in anticipation of Module 4 content.

T: (Project the shape sheet which includes the following: a square, rhombus that is not a square, rectangle that is not a square, and several quadrilaterals that are not squares, rhombuses, or rectangles.) How many sides are in each polygon?

S: 4.

T: On your boards, write down the name for any four-sided polygon. (Students write quadrilateral.)

T: (Point to the square.) This quadrilateral has four equal sides and four right angles. On your board, write what type of quadrilateral it is. (Students write square.)
T: Rhombuses are quadrilaterals with four equal sides. Is this polygon a rhombus?
S: Yes.
T: Is it a rectangle?
S: Yes.
T: (Point at the rhombus that is not a square.) This polygon has four equal sides, but the angles are not the same. Write down the name of this quadrilateral.
S: (Write rhombus.)
T: Is the square also a rhombus?
S: Yes!
T: (Point at the rectangle that is not a square.) This polygon has four equal angles, but the sides are not equal. Write down the name of this quadrilateral.
S: (Write rectangle.)
T: Draw a quadrilateral that is not a square, rhombus, or rectangle.

Group Count (4 minutes)

Note: This drill prepares students to divide with remainders.

Direct students to count forward and backward, occasionally changing the direction of the count.
- Sixes to 60
- Sevens to 70
- Eights to 80
- Nines to 90

Multiply Units (4 minutes)

Materials: (S) Personal white boards

Note: This fluency reviews Lesson 4’s content.

T: (Write $3 \times 3 = \underline{\hspace{2cm}}$.) Say the multiplication sentence. In unit form.
S: $3$ ones $\times 3 = 9$ ones.
T: Write the answer in standard form.
S: (Write $9$.)
T: (Write $30 \times 3 = \underline{\hspace{2cm}}$.) Say the multiplication sentence in unit form.
S: $3$ tens $\times 3 = 9$ tens.
T: Write the answer in standard form.
S: (Write $90$.)

Continue with the following possible sequence: $3$ hundreds $\times 3$, $3$ thousands $\times 3$, $4$ ones $\times 3$, $4$ tens $\times 3$, $4$ thousands $\times 3$, $5$ thousands $\times 2$, $5$ tens $\times 4$, $5$ hundreds $\times 8$, and $8$ tens $\times 6$. 
Application Problem (5 minutes)

Write an equation to find the unknown length of each rectangle. Then find the sum of the two unknown lengths.

Note: This Application Problem serves as an introduction to the Concept Development, in which the students find the total unknown lengths of a rectangle with an area of 672 square meters.

Concept Development (33 minutes)

Materials: (S) Personal white boards

Problem 1

672 ÷ 3 and 1,344 ÷ 6

T: Draw a rectangle with an area of 672 square inches and a width of 3 inches.
S: (Draw.)

T: Draw a new rectangle with the same area directly below, but partitioned to make it easy for you to divide each part using mental math and your knowledge of place value. (Allow time for students to work.)

T: Share with a partner how you partitioned your new rectangle.
S: I made one part 6 hundred, two parts of 3 tens, and one part 12 ones. → I made two parts of 3 hundreds, one part of 6 tens, and one part 12 ones. → I made mine one part 6 hundred and two parts 36.

T: Draw a number bond to match the whole and parts of your rectangles.
S: (Draw bonds as pictured to the right.)
T: Find the unknown side lengths of the smaller rectangles and add them to find the length of the largest rectangle.

T: Take a moment to record the number sentences, reviewing with your partner their connection to both the number bond and the area model.

Let the students work in partners to then partition the same area as 2 three hundreds. Those who finish early can find other ways to decompose the rectangle or work with 1,388 ÷ 6.

T: (Allow students to work for about four minutes.)
T: What were some ways you found to partition 1,344 to divide it easily by 6?
S: We chopped it into 12 hundreds, 12 tens, and 24 ones. → We decomposed it as 2 six hundreds, 2 sixties, and 24. → I realized 1,344 is double 672. But 6 is double 3 and that’s like the associative property 672 × 2 × 3, so 1,344 ÷ 6 equals 672 ÷ 3!

T: How can we see from our bonds that 1,344 is double 672?
S: When we chopped up the rectangles, I saw 600, 60, and 12 made 672, and the chopped up rectangle for 1,344 had two of all those!
T: Explain to your partner why different ways of partitioning give us the same correct side length.
S: You are starting with the same amount of area but just chopping it up differently. → The sum of the lengths is the same as the whole length. → You can take a total, break it into two parts, and divide each of them separately.
Problem 2

672 ÷ 3

T: (Write 672 ÷ 3.) This expression can describe a rectangle with an area of 672 square units. We are trying to find out the length of the unknown side.

T: What is the known side length?
S: 3.

T: (Draw a rectangle with a width of 3.) Three times how many hundreds gets us as close as possible to an area of 6 hundreds (point to the 6 hundreds of the dividend)?
S: 2 hundreds.

T: Let’s give 2 hundreds to the length. (Label 2 lengths of hundreds.) Let’s record the 2 hundreds in the hundreds place.

T: What is 3 times 2 hundreds?
S: Six hundreds. (Record 6 below the 6 hundreds.)

T: How many square units is that?
S: 600 square units. (Record 600 square units in the rectangle.)

T: How many hundreds remain?
S: Zero.

T: (Record 0 hundreds below the 6 hundreds.) 0 hundreds and 7 tens is? (Record the 7 tens to the right of the 0 hundreds.)
S: 7 tens.

T: We have 70 square units left with a width of 3. (Point to the 7 tens in the algorithm.) Three times how many ones gets us as close as possible to an area of 7 tens?
S: 2 tens.

T: Let’s give 2 tens to the length.

T: 3 times 2 tens is?
S: 6 tens.

T: How many square units?
S: 60 square units.

T: 7 tens – 6 tens is?
S: 1 ten.
T: That is 10 square units of area to add to 2 square units. The remaining area is?
S: 12 square units!
T: 3 times how many ones gets us as close as possible to 12 ones?
S: 4 ones.
T: Let’s give 4 ones to the length.
T: 3 times 4 ones is?
S: 12 ones.
T: Do we have any remaining area?
S: No!
T: What is the length of the unknown side?
S: 224 length units.
T: Review our drawings and our process with your partner. Try to reconstruct what we did step by step before we try another one. (Allow students time to review.)
T: We solved 672 divided by 3 in two very different ways using the area model. First we started with the whole rectangle and partitioned it. The second way was to go one place value at a time and make the whole rectangle from parts.

Give students the chance to try the following problems in partners, in a small group with you, or independently, as they are able.

539 ÷ 2
This first practice problem has an easy divisor and a remainder in the ones. Guide students to determine the greatest length possible first for the remaining area at each place value. This means the remainder will not be included in the final step.

438 ÷ 5
This next practice problem involves seeing the first area as 40 tens and also has a remainder of 3 in the ones.

1,216 ÷ 4
The final practice problem involves a four-digit number. Like the previous example, students must see the first area as 12 hundreds and the next area as 16 ones.

**Problem Set (13 minutes)**

Students should do their personal best to complete the Problem Set within the allotted 13 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.

**NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:**
Guide English language learners and students working below grade level who may not complete the Problem Set in the allotted 13 minutes to set specific goals for their work. After briefly considering their progress, strengths, and weaknesses, have students choose the problems they will solve strategically. For example, a learner who is perfecting sequencing his written explanations might choose Problem 2. Connect this short-term goal to long-term goals.
Student Debrief (10 minutes)

Lesson Objective: Explain the connection of the area model of division to the long division algorithm for three- and four-digit dividends.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- In Problem 1, is there another way Ursula could have represented the division problem with an area model? Would your number bond in 1(b) need revision if the area model changed?
- Compare your area model in Problem 2(a) to your partner’s. Is it easier to solve the area model separating it into 2 parts, 3 parts, 4 parts, etc?
- How do you decide how many parts are needed when building the area model for division?
- How are area models, number bonds, and the long division algorithm connected? Is there a correct order in which to use them to solve division problems?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.
1. Ursula solved the following division problem by drawing an area model.

   ![Area Model](image)

   a. What division problem did she solve?

   b. Show a number bond to represent Ursula’s area model and represent the total length using the distributive property.

2. a. Solve $960 \div 4$ using the area model. There is no remainder in this problem.

   ![Area Model](image)

   b. Draw a number bond and use the long division algorithm to record your work from (a).
3. a. Draw an area model to solve $774 \div 3$.

b. Draw a number bond to represent this problem.

c. Record your work using the long division algorithm.

4. a. Draw an area model to solve $1,584 \div 2$.

b. Draw a number bond to represent this problem.

c. Record your work using the long division algorithm.
1. Anna solved the following division problem by drawing an area model.

   ![Area Model](image)

   a. What division problem did she solve?

   b. Show a number bond to represent Anna’s area model and represent the total length using the distributive property.

2. a. Draw an area model to solve \(1,368 \div 2\).
   
   ![Area Model](image)

   b. Draw a number bond to represent this problem.

   c. Record your work using the long division algorithm.
1. Arabelle solved the following division problem by drawing an area model.

![Area Model](image)

a. What division problem did she solve?

b. Show a number bond to represent Arabelle’s area model and represent the total length using the distributive property.

2. a. Solve 816 ÷ 4 using the area model. There is no remainder in this problem.

b. Draw a number bond and use a written method to record your work from (a).
3. a. Draw an area model to solve $549 \div 3$.

   b. Draw a number bond to represent this problem.
   c. Record your work using the long division algorithm.

4. a. Draw an area model to solve $2,762 \div 2$.

   b. Draw a number bond to represent this problem.
   c. Record your work using the long division algorithm.