3 Divide by a Whole Number

TRIUMPH AFTER TRAGEDY

Susquehanna River Basin **July 4, 1972**

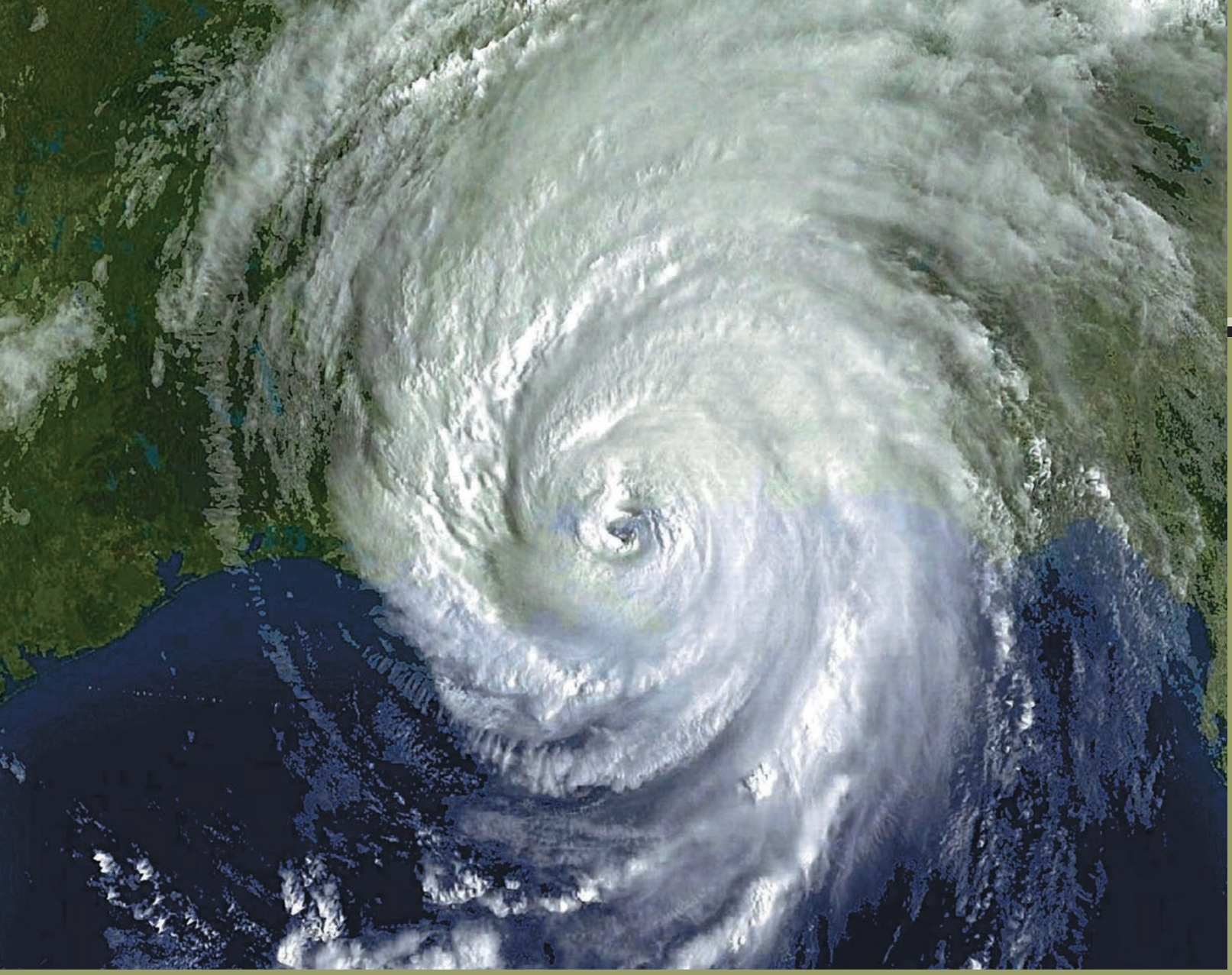
In June of 1972, a tropical storm began whirling across the waters of the Gulf of Mexico. Moving northeast, Hurricane Agnes pounded against the coast of the Florida panhandle and then continued north along the Atlantic coast. After passing through Georgia, the Carolinas, Virginia, Maryland, and New Jersey, it suddenly turned west and poured torrential rains on Pennsylvania and New York. The rain caused rivers in this region to swell and overflow their banks. The Susquehanna River in Wilkes-Barre, Pennsylvania, rose 30–35 feet above its normal level. By the time the storm finally died down, it had flooded 4,500 miles of rivers and caused water damage to 25 cities in 5 different states. Approximately 300,000 people were left homeless.

Emergency personnel rescue residents from submerged houses in New Orleans after Hurricane Katrina made landfall in August 2005.

Hurricane Agnes had devastated a whole section of America, but the survivors refused to become discouraged. Caring people rallied together to help families overcome the tragedy. The American Red Cross immediately went to work in the hurricane-ravaged areas. Red Cross volunteers labored with police, fire departments, the National Guard, and other community groups to help the hurricane victims. They set up shelters for the homeless and provided them with food and clothing. They tried to locate places for these people to live while their damaged homes were being repaired. They gave families money to buy new appliances.

One church group decided to use their Fourth of July holiday to help clean up and repair two damaged cities. The volunteers arrived in Wilkes-Barre and in Elmira, New York, with tents, shovels, brooms, buckets, and tools. They cleared away massive amounts of debris that the hurricane had left in streets, yards, and houses. Men went into the deserted homes and hauled ruined furniture out of them. Women and children scrubbed walls to rid them of dried mud and swept debris from the rooms. Soon the sounds of hammering and sawing could be heard as the volunteers repaired roofs and rebuilt broken walls.

Although it took much time and money to restore damaged homes and buildings, people were eventually able to return to their communities. The relief campaign to help the victims of Hurricane Agnes was one of the largest in the country's history.



Hurricane Agnes deluged the rivers of the mid-Atlantic region with almost 28 trillion gallons of water.

Most of the hurricanes in the Atlantic Ocean develop between June and November, with September being the peak month.

Hurricanes in the Pacific are called *typhoons*; those in the Philippines are called *baguíos*; and those in India and Australia are called *cyclones*.

A tropical storm is categorized as a hurricane when its sustained winds reach 74 mph.

In August of 2005, Hurricane Katrina, classified as a category 5 hurricane (sustained winds greater than 155 mph) while in the Gulf of Mexico, caused extensive damage when it made landfall in Louisiana as a category 3 hurricane.

Divide by a Whole Number

Lesson	Topic	Lesson Objectives
21	**Division**	• Demonstrate an understanding of division and the terms *dividend*, *divisor*, and *quotient* • Demonstrate an understanding of the inverse relationship between multiplication and division • Divide by a 1-digit divisor to find a 2- or 3-digit quotient • Solve a division word problem • Interpret a remainder • Check a division problem using multiplication
22	**Multiples of 10**	• Recognize numbers divisible by 2, 3, 4, 5, 6, 9, or 10 • Divide multiples of 10 using mental math • Divide by a 2-digit multiple of 10 • Solve a division word problem • Estimate a quotient • Interpret a remainder • Check a division problem using multiplication
23	**2-Digit Divisors**	• Divide by a 2-digit divisor • Estimate a quotient • Solve a division word problem • Adjust the quotient in a division problem • Interpret a remainder • Check a division problem using multiplication
24	**Divide a Decimal by a Whole Number**	• Divide a decimal by a 1-digit whole number • Annex a zero to rename a decimal • Check a division problem using multiplication • Estimate a quotient • Divide to find a quotient less than 1 • Express a fraction as an equivalent decimal • Solve a division word problem • Interpret a remainder
25	**Divide a Decimal by 2-Digit Divisors**	• Determine an average (mean) or a unit rate • Divide a decimal by a 2-digit whole number • Estimate a quotient • Divide to find a quotient less than 1 • Annex a zero to rename a decimal • Solve a division word problem • Interpret a remainder • Express a fraction as an equivalent decimal
26	**Divide by a Power of 10**	• Divide by a power of 10 • Divide a whole number by a 1-, 2-, or 3-digit divisor • Divide a decimal by a 1-, 2-, or 3-digit whole number • Estimate a quotient • Solve a division word problem • Interpret a remainder
27	**Order of Operations**	• Use the Order of Operations to simplify an expression • Complete an expression to make an equation true
28	**Multi-Step Problems**	• Solve a multi-step problem • Use the Order of Operations to write an equation for a multi-step problem
29	**Chapter 3 Review**	• Review

Chapter Materials

Teacher Manipulatives Packet:
- Place Value Kit

Instructional Aids (Teacher's Toolkit CD):
- Cumulative Review Answer Sheet (page IA9) for each student
- Graph Paper (page IA13) for each student (optional)
- Short Form of Division (page IA16) (optional)
- Short Form of Division (page IA16) for each student (optional)
- Multi-Step Problems (page IA17)
- Multi-Step Problems (page IA17) for each student

Christian Worldview Shaping (Teacher's Toolkit CD):
- Pages 7–9

Math 6 Tests and Answer Key

Optional (Teacher's Toolkit CD):
- Fact Review pages
- Application pages
- Calculator Activities

When you use the manipulatives in your Place Value Kit to illustrate dividing a decimal (Lessons 24–25), the red side (the back) of the hundreds is referred to as the ones, the orange side of the tens is referred to as the tenths, and the purple side of the ones is referred to as the hundredths.

Divide by a Whole Number

Lesson	Topic	Lesson Objectives	Chapter Materials
30	**Chapter 3 Test** **Cumulative Review**	• Solve multiplication and division equations • Determine the exponent form for a repeated multiplication equation • Determine the greatest common factor of 2 numbers • Determine the least common multiple of 2 numbers • Identify the multiplication expression for an exponent form, an array, a picture, or a part-whole model • Identify the value of a digit in a number • Determine the standard form of a decimal written in word form • Compare and order whole numbers and decimals • Identify the decimal form of a fraction • Read and interpret a line graph	

A Little Extra Help

Use the following to provide "a little extra help" for the student that is experiencing difficulty with the concepts taught in Chapter 3.

Solve division problems—Division may be difficult for the student because three operations are involved: division, multiplication, and subtraction. Try to determine which areas the student is having difficulty with. Does he understand the following: where to start, how to round the divisor, the steps used in the division process, and when to adjust the quotient? Determine whether the student knows the basic facts and whether he is making multiplication and/or subtraction errors. When solving a division problem, it may help the student to rewrite the divisor beside each new dividend.

```
     124 r10
53) 6,582
  - 53↓
53) 128
  - 106↓
53)  222
   - 212
     10
```

Some of the common errors that a student may make are shaded in the following problems. Provide the problems, shading the areas shown. Tell the student that there are errors in the shaded sections and instruct him to locate the error in each problem. If the student is unable to find the error, give him some clues or ask a question, such as, "Is this subtracted correctly?" Direct the student to write the problems on paper and to solve them correctly. ***33 r2, 108 r13, 273 r5***

```
30
     34 r14
28) 926
  - 84↓
   126
  - 112
    14

     111 r11
14) 1,525
  - 14↓
    12
  - 14
    25
  - 14
    11

     27  r7
23)6,284
 - 46↓
   168
 - 161
     7
```

To facilitate alignment when solving division problems, allow the student to use graph paper or lined notebook paper turned sideways, or provide copies of the Graph Paper page (page IA13 of the Instructional Aids section of the Teacher's Toolkit CD).

Math Facts

Throughout this chapter, review multiplication and division facts using Fact Review pages or a Fact Fun activity on the Teacher's Toolkit CD, or you may use flashcards.

Lesson 21

Student Text pp. 50–53

Daily Review p. 410a

Objectives

- Demonstrate an understanding of division and the terms *dividend*, *divisor*, and *quotient*
- Demonstrate an understanding of the inverse relationship between multiplication and division
- Divide by a 1-digit divisor to find a 2- or 3-digit quotient
- Solve a division word problem
- Interpret a remainder
- Check a division problem using multiplication

Teacher Materials

- Place Value Kit: tens and ones

Note

Preview the Fact Review pages, the Application pages, and the Calculator Activities located on the Teacher's Toolkit CD.

Introduce the Lesson

Guide the students in reading aloud the story and facts on pages 50–51 of the Student Text (pages 48–49 of this Teacher's Edition).

Teach for Understanding

Demonstrate an understanding of division

1. Write the following problems for display. Remind the students that division problems can be written in equation form, fraction from, and in a division frame. Elicit that the *dividend* is the number being divided and that it represents the whole (the total); the *divisor* is the number you divide by; and the *quotient* is the answer. Remind them that the divisor and the quotient can represent the number of parts (sets) or the number in each part (the number in each set).

   $18 \div 6 =$ ***3*** $\quad \frac{24}{4} =$ ***6***

   $42 \div 7 =$ ***6*** $\quad \frac{12}{3} =$ ***4*** $\quad 9\overline{)27}$ ***3*** $\quad 5\overline{)35}$ ***7***

2. Choose students to solve the problems and to identify the dividend, divisor, and quotient in each problem. Instruct each student to tell which number represents the total (whole).
3. Display 3 sets of 4 ones from the Place Value Kit and write $3 \times 4 = 12$ for display. Remind the students that the first factor (multiplier) indicates the number of sets, the second factor (multiplicand) indicates the number in each set, and the product is the total.

   Choose a student to apply the Commutative Property to write the related multiplication fact below $3 \times 4 = 12$.

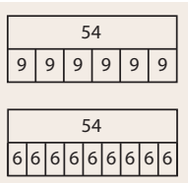
   4 × 3 = 12
4. Remind the students that division is the inverse or opposite operation of multiplication. Point out that when you multiply, you join equal sets to find the total (whole). However, when you divide, you distribute the total to find the number of equal sets or to find the number in each equal set.

   Choose students to write the related division equations in the fact family below the multiplication facts. ***12 ÷ 3 = 4 and 12 ÷ 4 = 3***
5. Write the following multiplication equations for display. For each equation, guide the students in writing and solving a related division equation to find the value of n. Choose students to draw a part-whole model for each pair of related facts.

   $6 \times n = 54$ $\quad n \times 6 = 54$

   54 ÷ 6 = 9 $\quad$ ***54 ÷ 6 = 9***

   n = 9 $\quad$ ***n = 9***

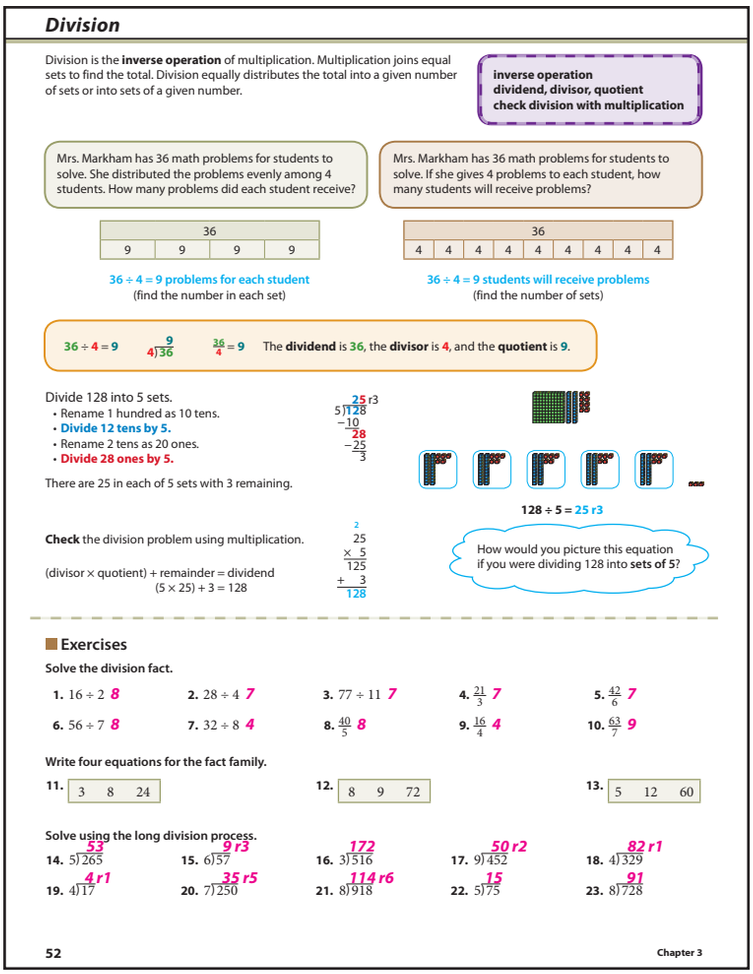
   Lead a discussion about the similarities and differences between the models. Emphasize the total (whole), number of sets (parts), and the number in each set.

Divide to find a 2- or 3-digit quotient

Alexandra has 77 apples. She will place an equal number of apples in 3 baskets. How many apples will Alexandra place in each basket? ***25 apples***

- **What represents the total?** ***77 apples***
- **What represents the number of sets?** ***the 3 baskets***
- **What represents the number in each set?** ***Elicit that the unknown number of apples in each basket represents the number in each set.***
- **How can you determine the number of apples that Alexandra will place in each basket?** ***Divide the total (77 apples) by the number of baskets (3).***

1. Write the equation for display: $77 \div 3 =$ ___.
   - **Is 77 ÷ 3 a basic division fact?** ***no***
2. Write 77 ÷ 3 in a division frame and display 7 tens and 7 ones. Remind the students that they can use the long division process to divide numbers that are not memorized facts and that long division is a series of math operations used to solve a division problem: division, multiplication, and subtraction.
   - **What do you divide first?** ***the tens*** **Why?** ***The Tens place is the place of greatest value in the dividend.***
   - **Are there enough tens to divide them equally among 3 sets?** ***yes***
3. Write a small x between the division frame and the 7 in the Tens place of the dividend and another x between the division frame and the 7 in the Ones place. Elicit that the x's indicate the number of digits (2) that will be in the quotient.
4. Divide the 7 tens equally among 3 sets.
   - **How many tens are in each set?** ***2 tens*** Write 2 in the Tens place of the quotient in the problem.
   - **What do you do after you divide the tens?** ***Multiply the tens in the quotient by the divisor.***
   - **What is the product of 3 × 2 tens?** ***6 tens*** Write 6 below the 7 in the Tens place of the dividend. (Do not write the minus sign yet.)
   - **What do you do next?** ***Subtract to find the new dividend.*** Write a minus sign in front of the 6 and draw a line below it.
   - **What is the difference?** ***1*** Write the difference 1. Point to the 1 remaining ten displayed and explain that the difference is the remaining 1 ten after the 7 tens were divided.
   - **What do you do after you divide, multiply, and subtract the tens?** ***Divide the ones.***
   - **How many ones are there to divide?** ***Elicit that there are 17 ones because you renamed the remaining 1 ten as ten ones; 10 ones plus the 7 ones in the original dividend is 17 ones.*** Rename the 1 ten as 10 ones and place them beside the 7 ones. Write 7 in the new dividend in the division problem.



Division

Division is the **inverse operation** of multiplication. Multiplication joins equal sets to find the total. Division equally distributes the total into a given number of sets or into sets of a given number.

inverse operation
dividend, divisor, quotient
check division with multiplication

Mrs. Markham has 36 math problems for students to solve. She distributed the problems evenly among 4 students. How many problems did each student receive?

36			
9	9	9	9

$36 \div 4 = 9$ problems for each student
(find the number in each set)

Mrs. Markham has 36 math problems for students to solve. If she gives 4 problems to each student, how many students will receive problems?

36								
4	4	4	4	4	4	4	4	4

$36 \div 4 = 9$ students will receive problems
(find the number of sets)

$36 \div 4 = 9$ $4\overline{)36}^{\,9}$ $\frac{36}{4} = 9$ The **dividend** is 36, the **divisor** is 4, and the **quotient** is 9.

Divide 128 into 5 sets.
- Rename 1 hundred as 10 tens.
- **Divide 12 tens by 5.**
- Rename 2 tens as 20 ones.
- **Divide 28 ones by 5.**

There are 25 in each of 5 sets with 3 remaining.

$5\overline{)128}$ → -10 → 28 → -25 → 3 ; quotient 25 r3

$128 \div 5 = 25$ r3

How would you picture this equation if you were dividing 128 into **sets of 5**?

Check the division problem using multiplication.

(divisor × quotient) + remainder = dividend
$(5 \times 25) + 3 = 128$

$25 \times 5 = 125$; $125 + 3 = 128$

Exercises

Solve the division fact.

1. $16 \div 2$ **8**
2. $28 \div 4$ **7**
3. $77 \div 11$ **7**
4. $\frac{21}{3}$ **7**
5. $\frac{42}{6}$ **7**
6. $56 \div 7$ **8**
7. $32 \div 8$ **4**
8. $\frac{40}{5}$ **8**
9. $\frac{16}{4}$ **4**
10. $\frac{63}{7}$ **9**

Write four equations for the fact family.

11. 3, 8, 24
12. 8, 9, 72
13. 5, 12, 60

Solve using the long division process.

14. $5\overline{)265}$ **53**
15. $6\overline{)57}$ **9 r3**
16. $3\overline{)516}$ **172**
17. $9\overline{)452}$ **50 r2**
18. $4\overline{)329}$ **82 r1**
19. $4\overline{)17}$ **4 r1**
20. $7\overline{)250}$ **35 r5**
21. $8\overline{)918}$ **114 r6**
22. $5\overline{)75}$ **15**
23. $8\overline{)728}$ **91**

Write a division equation for the phrase.
Draw a part-whole model to illustrate.

24. 20 cups of coffee placed on 5 tables — **$20 \div 5 = 4$ cups**
25. 40 balloons tied in groups of 4 — **$40 \div 4 = 10$ groups**
26. 96 blankets delivered to 8 shelters — **$96 \div 8 = 12$ blankets**

Solve.

27. Bailey is in charge of making sandwiches for the relief shelter. She has 219 slices of bread. How many sandwiches can she make using 2 slices of bread for each? What can be done with any extra bread? **$219 \div 2 = 109$ r1; 109 sandwiches; make a half sandwich**
28. Calvary Baptist Church donated cases of orange juice to a relief shelter after a hurricane. There are 32 ounces of juice in each carton. How many 6-ounce servings can be poured from one carton? **$32 \div 6 = 5$ r2; 5 servings**
29. Caleb helped his father deliver cots to shelters. There were 749 cots in storage. Three hundred additional cots were purchased. How many could be left at each of the seven shelters? **$749 + 300 = 1{,}049$; $1{,}049 \div 7 = 149$ r6; at least 149 cots**

Find the missing part.

30. The divisor is 7. The dividend is 364. The quotient is **52** — **$364 \div 7 = 52$**
31. The divisor is 9. The dividend is **2,439** The quotient is 271. — **$9 \times 271 = 2{,}439$**
32. The divisor is **124** The dividend is 620. The quotient is 5. — **$620 \div 5 = 124$**

Practice & Application

33. Find the product of 370 and 49. **18,130**
34. Use front-end estimation to estimate the sum of 329,683 and 731,990. **1,050,000**
35. Subtract 32,786 from 700,000. **667,214**
36. Write 17.586 in expanded form. **$(1 \times 10) + (7 \times 1) + (5 \times 0.1) + (8 \times 0.01) + (6 \times 0.001)$**
37. Write the value of 3 in 93,290,000 in word form. **three million**
38. What is the greatest place in 76,500,000,000? **Ten Billions place**
39. Use division to find the missing factor in $n \times 6 = 90$. **$90 \div 6 = 15$; n = 15**
40. Write 23.097, 23.9, 23.079, and 23.709 from *least* to *greatest*. **23.079, 23.097, 23.709, 23.9**

J Solve 739 ÷ 4. Draw a picture using ■ for hundreds, | for tens, and ● for ones to illustrate 739 being divided into 4 sets. **184 r3**

Churches often serve as emergency Red Cross shelters during hurricanes and other natural disasters. Church members donate their time and resources to minister to displaced and hurting people.

Complete DAILY REVIEW a on page 410.

5. Divide the 17 ones equally among the 3 sets. Place the 2 remaining ones to the right of the 3 sets.
   - ➤ **How many ones are in each set? *5 ones*** Write 5 in the Ones place of the quotient.
   - ➤ **What do you do after you divide? *Multiply the ones in the quotient by the divisor.***
   - ➤ **What is the product? *15*** Write 15 below the dividend 17. (Do not write the minus sign yet.)
   - ➤ **What do you do next? *Subtract 15 from 17.*** Write a minus sign in front of the 15 and draw a line below it.
   - ➤ **What is the difference? *2*** Write the difference 2.
   - ➤ **What does the difference of 2 represent? *2 apples remain after the total of 77 apples have been equally divided among the 3 baskets***
6. Write *r2* beside the quotient and complete the equation. Remind the students that the *remainder* is a part that is left when a dividend is not divisible by the divisor. Point out that sometimes the remainder is not needed to answer the question; therefore, they can omit the remainder when writing the final answer.
   - ➤ **How many apples will be placed in each basket? *25***
   - ➤ **Is the remainder needed to answer the question in this word problem? *no***

   Write *25 apples* below 25 r2 in the equation.
7. Elicit from the students that they can check the quotient using multiplication. Demonstrate multiplying the quotient 25 by the divisor 3 and adding the remainder 2 to the product. Point out that the final answer should match the dividend 77.
8. Follow a similar procedure as you guide the students in solving these word problems on paper, without using manipulatives. Remind the students that they must write a zero in the quotient as a placeholder when there is not enough to divide. The zero shows that that place in the quotient has no value.

Jorge's school collected 3,624 cans of food for the Thanksgiving food drive. The teachers will divide the cans of food equally among 6 homeless shelters. How many cans of food will each shelter receive? ***3,624 ÷ 6 = 604 cans*** [BAT: 5b Giving]

Erika needs to place 43 sandwiches in a refrigerated display case. She plans to place 4 sandwiches per row in the display case. How many rows of 4 sandwiches will there be? ***43 ÷ 4 = 10 r3; 10 rows*** [BAT: 2e Work]

- ➤ **Since all 43 sandwiches need to be placed in the display case, what do you think Erika can do with the remaining 3 sandwiches? *Possible answers: make an eleventh row; place 1 additional sandwich in each of 3 rows so that there are 3 rows of 5 sandwiches and 7 rows of 4 sandwiches.***

9. Lead a discussion about the 3 word problems. Guide the students to the conclusion that to solve the first 2 problems, they divided by the number of sets to find the number in each set; to solve the last problem, they divided by the number in each set to find the number of sets.

Student Text pp. 52–53

Lesson 22

Student Text pp. 54–55
Daily Review p. 410b

Objectives
- Recognize numbers divisible by 2, 3, 4, 5, 6, 9, or 10
- Divide multiples of 10 using mental math
- Divide by a 2-digit multiple of 10
- Solve a division word problem
- Estimate a quotient
- Interpret a remainder
- Check a division problem using multiplication

Note
You may choose to introduce the short form of division to your students during this lesson or at any time throughout this chapter; use the Short Form of Division page (page IA16 in the Instructional Aids section of the Teacher's Toolkit CD).

Teach for Understanding

Recognize numbers divisible by 2, 3, 4, 5, 6, 9, or 10

1. Guide the students in reading the Divisibility Rules on page 502 of the Student Text Handbook. Remind the students that a number is divisible by another number when it can be equally divided with no remainder.

➤ **Why are numbers that are divisible by 2, 4, 6, 8, or 10 always even numbers?** ***Elicit that 2 is a factor of every even number and 4, 6, 8, and 10 are divisible by 2, so numbers that are divisible by 4, 6, 8, or 10 are also even numbers.***

➤ **Will a number divisible by 9 also be divisible by 3? Why?** ***Yes; elicit that every 9 is 3 sets of 3, so every multiple of 9 is also divisible by 3.***

➤ **Can an even number be divisible by 9? Why?** ***Yes; elicit that every other multiple of 9 (18 [2 × 9], 36 [4 × 9], 54 [6 × 9]) is an even number that is divisible by 9.***

➤ **Will a number divisible by 9 also be divisible by 6? Why?** ***Elicit that every 9 is $1\frac{1}{2}$ of 6, so every other multiple of 9 (the even multiples) is also divisible by 6.***

2. Ask similar questions to determine the relationship between multiples of 2, 5, and 10 or multiples of 2, 3, and 6.
3. Write these numbers for display. Choose students to tell what divisors each displayed number is divisible by and explain their answers.

495 *3, 5, 9*	264 *2, 3, 4, 6*	450 *2, 3, 5, 6, 9, 10*
112 *2, 4*	3,744 *2, 3, 4, 6*	81,030 *2, 3, 5, 6, 10*

Divide multiples of 10 using mental math

Piper collected 420 stamps. She will place 60 stamps on each page of her stamp album. On how many pages will she place stamps? *7 pages*

➤ **What operation will you use to solve this problem? Why?** ***Division; elicit that the total 420 is being distributed into equal sets of 60, which is the process of division.***

1. Write 420 ÷ 60 = __ for display.

➤ **How many groups of 60 can you make from 420? Explain your answer.** ***7; possible explanations: 60 + 60 + 60 + 60 + 60 + 60 + 60 = 420; 7 × 60 = 420, 7 × (6 × 10) = (7 × 6) × 10 = 420; since 42 ÷ 6 = 7, 420 ÷ 60 = 7.***

Choose a student to complete the division equation. *7 pages*

2. Write these problems for display. Choose students to solve the problems mentally and explain how they found the quotients. Give guidance as needed.

$40\overline{)360}$ *9*	$40\overline{)3{,}600}$ *90*	$40\overline{)36{,}000}$ *900*
$50\overline{)300}$ *6*	$50\overline{)3{,}000}$ *60*	$50\overline{)30{,}000}$ *600*
120 ÷ 40 = *3*	1,200 ÷ 40 = *30*	12,000 ÷ 40 = *300*

➤ **What do you notice about the quotients in 2 equations that have the same divisor but the second dividend is 10 times greater than the first dividend?** ***The second quotient is 10 times greater than the first quotient.***

Divide by a 2-digit multiple of 10

Mia wants to purchase containers in which to store her 261 Christmas-tree ornaments. She can fit 40 ornaments in the type of storage container she plans to purchase. How many containers does she need to store all of her ornaments? *7 containers*

➤ **What equation can you use to solve this problem? Why?** ***261 ÷ 40 = __; elicit that the total 261 is being distributed into equal sets of 40.***

1. Write 261 ÷ 40 in a division frame for display. Use the following procedure to guide the students in solving the problem on paper.

➤ **In which place will you write the first digit of the quotient? Why?** ***Ones; elicit that there are not enough hundreds (2) nor enough tens (26) to distribute them in sets or groups of 40 unless you rename the hundreds and the tens as ones. There are enough ones (261) to distribute them in sets of 40.*** Write a small *x* above the 1 in the Ones place of the dividend to mark the location of the first digit in the quotient.

2. Remind the students that the multiples of a number are *compatible* and are easy to work with mentally.

➤ **What near multiplication facts can help you determine compatible numbers for this division problem?** ***Elicit 6 × 4 = 24 and 7 × 4 = 28.***

➤ **What multiple of 40 is closest to 261 without being greater than 261? How do you know?** ***Elicit 240; 6 × 40 = 240 is less than the dividend of 261, but the next multiple of 40 (7 × 40 = 280) is greater than the dividend.***

➤ **What is 261 ÷ 40? *6* Why?** ***Elicit 6 ones times the divisor 40 equals 240, which is less than the dividend 261; the quotient cannot be 7 because 7 ones times the divisor 40 equals 280, which is greater than the 261 in the dividend.***

3. Write 6 in the Ones place of the quotient. Demonstrate multiplying 6 × 40 and subtracting 240 from the dividend 261. Write the remainder 21 (the difference) beside the quotient: *6 r21.*

➤ **How many storage containers will Mia need to store all of her ornaments? Why?** ***7; elicit that 6 full containers will hold 40 ornaments each, and 1 additional container is needed to hold the remaining 21 ornaments.*** Write *7 containers* next to *6 r21.* Point out that in some situations when there is a remainder, 1 more must be added to the quotient to solve the problem.

4. Choose a student to demonstrate checking the division problem. *(6 × 40) + 21 = 261*
5. Write 5,431 ÷ 50 for display in a division frame. Explain that the owner of a local business wants to store 5,431 Christmas ornaments equally in 50 large storage containers.

➤ **What do the 50 storage containers represent?** ***Elicit the number of sets that the total 5,431 is being distributed among.***

➤ **What will the quotient represent?** ***the number in each set***

Multiples of 10

A whole number is **divisible** by another whole number if there is no remainder. You can use **divisibility rules** to determine whether a whole number is divisible by 2, 3, 4, 5, 6, 9, or 10.

divisible
divisibility rules
compatible numbers

Divide by Multiples of 10

Use mental math to find the quotient when the dividend and the divisor are multiples of 10. When only the divisor is a multiple of 10, think of **compatible numbers** as you use the long division process.

1. Decide where to start.

$50\overline{)4{,}500}$ (xx)

$40\overline{)1{,}651}$ (xx)

2. Think of the basic fact or think of the compatible numbers.

$90 \times 50 = 4{,}500$

$40 \times 40 = 1{,}600$

3. Solve using mental math or solve using the long division process.

$50\overline{)4{,}500}$ (90)

$40\overline{)1{,}651}$ (41 r11)

$-\ 160$

51

$-\ 40$

11

Exercises

Choose the divisors that the number is divisible by.

1. 590 is divisible by ___. (2) 3 (5) (10)
2. 1,265 is divisible by ___. 2 (5) 9 10
3. 486 is divisible by ___. (2) (3) 4 (9)
4. 138 is divisible by ___. (2) (3) (6) 9
5. 1,784 is divisible by ___. (2) 3 (4) 6
6. 756 is divisible by ___. (2) (4) (6) (9)

Solve.

7. $5\overline{)6{,}315}$ (1,263)
8. $4\overline{)1{,}096}$ (274)
9. $8\overline{)4{,}790}$ (598 r6)
10. $3\overline{)945}$ (315)
11. $9\overline{)8{,}199}$ (911)
12. $20\overline{)480}$ (24)
13. $30\overline{)1{,}590}$ (53)
14. $50\overline{)2{,}043}$ (40 r43)
15. $80\overline{)2{,}560}$ (32)
16. $70\overline{)4{,}505}$ (64 r25)
17. $1{,}860 \div 30$ (62)
18. $669 \div 30$ (22 r9)
19. $725 \div 80$ (9 r5)
20. $2{,}485 \div 20$ (124 r5)
21. $5{,}307 \div 10$ (530 r7)

Use mental math to solve.

22. $140 \div 20$ (7)
23. $500 \div 50$ (10)
24. $6{,}300 \div 90$ (70)
25. $80{,}000 \div 40$ (2,000)
26. $210 \div 70$ (3)

Use the statement to write an equation and solve.

Michael has 145 marbles.

27. How many pouches will he need if he puts 5 marbles in each pouch? *145 ÷ 5 = 29; 29 pouches*
28. How many pouches will he need if he puts 8 marbles in each pouch? *145 ÷ 8 = 18 r1; 18 pouches, 1 marble left over*
29. If Michael has only 4 pouches, how many marbles will be in each? *145 ÷ 4 = 36 r1; 36 marbles, 1 left over*

Madeline has 129 flower seeds.

30. If she sorts the seeds into 5 groups, how many seeds will be in each group? *129 ÷ 5 = 25 r4; 25 seeds in each group, 4 left over*
31. What can she do with the extra seeds? *Make another group or add to the existing groups.*
32. If Madeline puts 3 seeds in each starter cup, how many cups will she have? *129 ÷ 3 = 43 cups*

Write an equation and solve. Draw a picture to illustrate. Explain what could be done with the remainders.

33. 63 golf balls shared by 9 golfers — *63 ÷ 9 = 7; 7 golf balls*
34. 110 pencils in groups of 5 — *110 ÷ 5 = 22; 22 groups*
35. 32 orange segments shared among 5 siblings — *32 ÷ 5 = 6 r2; 6 segments each*

Use mental math to solve.

36. $90\overline{)3{,}600}$ (40)
37. $50\overline{)15{,}000}$ (300)
38. $70\overline{)7{,}000}$ (100)
39. $20\overline{)400}$ (20)
40. $10\overline{)3{,}000}$ (300)

Complete the table.

41.

Rule: × 4	
In	Out
6	*24*
60	*240*
600	*2,400*
6,000	*24,000*

42.

Rule: ÷ 8	
In	Out
32	*4*
320	*40*
3,200	*400*
32,000	*4,000*

43.

Rule: + 10,000	
In	Out
1,700	*11,700*
21,900	*31,900*
50,080	*60,080*
91,700	*101,700*

44.

Rule: – 100	
In	Out
1,600	*1,500*
2,000	*1,900*
18,473	*18,373*
20,000	*19,900*

Practice & Application

45. Write a division equation in which the divisor is 30, the dividend is 3,600, and the quotient is 120. *3,600 ÷ 30 = 120*
46. Complete the comparison sentence using >, <, or =. $(3 \times 2) \times 40$ = $(5 + 3) \times 30$
47. Write the name of the place for 3 in 1,139,468,000. *Ten Millions place*
48. Write the value of 7 in 1,786,908,000 in standard form. *700,000,000*
49. Round to the greatest place to estimate the sum of 689,300 and 103,599,201. *100,700,000*
50. Estimate the seating capacity of an auditorium if there are 48 rows of 65 chairs. *3,500 chairs*

J Explain how marking the places that will be in the quotient can help you find the correct quotient for $9\overline{)8{,}181}$ and $90\overline{)8{,}181}$. *Marking the places shows how many digits will be in the quotient and where you will begin writing the quotient.*

Complete DAILY REVIEW b on page 410.

➤ **Where will you write the first digit in the quotient? Why?** *In the Hundreds place; elicit that there are not enough one thousands (5) to distribute them equally among 50 sets; the 5 thousands must be renamed as 50 hundreds to distribute them equally among 50 sets.* Write small *x*'s above the digits in the Hundreds, Tens, and Ones places in the dividend.

➤ **What multiple or compatible number of the divisor 50 can you use to divide the hundreds? How do you know?** *Elicit 50 because 50 × 1 = 50, but the next multiple of 50 is 50 × 2 = 100, which is greater than 54.*

6. Write 1 in the Hundreds place of the quotient and demonstrate multiplying and subtracting the hundreds. Remind the students that writing the 3 from the original dividend to the right of the 4 in the new dividend renames the 4 hundreds and the 3 tens in the original dividend as 43 tens.

➤ **Are there enough tens (43) to place 1 ten in each of 50 sets?** *no* **What do you write in the quotient when there is not enough in a place to divide? Why?** *0; the zero acts as a placeholder, showing that none in that place were divided; it allows you to write the next digit in the correct place in the quotient, the next place of lesser value.* Write 0 in the Tens place of the quotient.

Write 1 to the right of the 43 in the new dividend. Elicit that the 43 tens were renamed as 430 ones to make a total of 431 ones to be divided.

➤ **What near multiplication facts can help you determine the compatible numbers to divide the ones?** *Elicit 5 × 8 = 40 and 5 × 9 = 45.*

➤ **What multiple or compatible number of the divisor 50 can you use to divide the ones? Why?** *400; 50 × 8 = 400, but 50 × 9 = 450 is greater than 431.*

7. Write an 8 in the Ones place of the quotient. Demonstrate multiplying and subtracting the ones. Write the remainder beside the quotient: *108 r31.*

➤ **What does the 108 in the quotient represent?** *the number of ornaments that can be stored equally in the 50 containers* **the remainder?** *31 ornaments that could not be equally distributed among the 50 containers*

➤ **How could the remaining ornaments be stored?** *Accept any reasonable answers.*

8. Choose a student to demonstrate checking the answer. *(50 × 108) + 31 = 5,431*
9. Follow a similar procedure for 869 ÷ 30 = *28 r29.*

Estimate a quotient

1. Write 1,587 ÷ 30 for display in a division frame.

➤ **How many digits will be in the quotient? How do you know?** *2; elicit that the 1 thousand and the 5 hundreds need to be renamed to make 158 tens so that they can be divided among 30 sets or divided into sets of 30.*

➤ **What multiplication fact can help you determine compatible numbers to divide this problem?** *Elicit 3 × 5 = 15.*

➤ **What compatible numbers can you use to estimate the quotient? Why?** *30 and 150 because 30 × 50 = 1,500*

2. Explain that since they know that the first digit in the quotient is at least 5 (5 tens or 50) with still more to divide, they can think of the estimate range as 50–60 (5 tens to 6 tens; 30 × 50 = 1,500 and 30 × 60 = 1,800). Write 50–60 in a think cloud above the problem.
3. Follow a similar procedure for these problems.
   6,543 ÷ 80 *80 – 90; 80 × 80 = 6,400 and 80 × 90 = 7,200*
   8,522 ÷ 30 *200 – 300; 30 × 200 = 6,000 and 30 × 300 = 9,000*

Student Text pp. 54–55

Lesson 23

Student Text pp. 56–57
Daily Review p. 411c

Objectives
- Divide by a 2-digit divisor
- Estimate a quotient
- Solve a division word problem
- Adjust the quotient in a division problem
- Interpret a remainder
- Check a division problem using multiplication

Teach for Understanding

Estimate a quotient

1. Write 7,830 ÷ 31 for display in a division frame.

➤ **How many digits will be in the quotient? How do you know?** ***3; elicit that the 7 one thousands need to be renamed as 78 hundreds so that they can be divided among 31 sets or divided into sets of 31.*** Write small *x*'s above the dividend to mark the Hundreds, Tens, and Ones places.

2. Explain that rounding the divisor to a multiple of 10 can help you determine compatible numbers. Remind the students that multiples of numbers are compatible numbers that can be used to estimate a quotient.

➤ **Is the divisor in this problem a multiple of 10?** ***no*** **What multiple of 10 does the divisor 31 round to?** ***30***

➤ **What multiplication facts can help you determine compatible numbers to divide this problem?** ***Elicit 3 × 2 = 6 and 3 × 3 = 9.***

➤ **What compatible numbers (multiples of the divisor 30) could you use to estimate the quotient? Why?** ***Elicit 30 and 60, and 30 and 90; accept 30 × 2 hundreds = 60 hundreds (30 × 200 = 6,000) or 60 hundreds ÷ 30 = 2 hundreds (the inverse operation), and 30 × 3 hundreds = 90 hundreds (30 × 300 = 9,000) or 90 hundreds ÷ 30 = 3 hundreds.***

➤ **Does the dividend 7,830 come between 6,000 and 9,000?** ***yes*** **What will the estimate range of the quotient be?** ***200–300*** Write 200–300 for display.

(***Note:*** Some students may determine that the quotient will be greater than 250 because 7,830 is closer to 9,000 than to 6,000.)

➤ **Which compatible numbers can you use to divide the 78 hundreds? Why?** ***30 and 60; elicit that they cannot be 30 and 90 because 90 ÷ 30 = 3, and 3 hundreds times the divisor 30 equals 90 hundreds, which is greater than the 78 hundreds in the dividend.***

➤ **What is 78 hundreds ÷ 30?** ***2 hundreds*** Write 2 in the Hundreds place of the quotient. Point out that the value of the 2 is 2 hundreds (200).

➤ **Will the exact answer be 200? Why?** ***No; elicit that the tens and ones still need to be divided, so the answer will be more than 200.***

3. Explain that since you know the first digit in the quotient is at least 2 hundreds or 200 with still more to divide, you can see that the exact quotient will be within the estimate range of 200–300.

4. Follow a similar procedure for these problems.

6,193 ÷ 89 ***(60–70)*** 9,857 ÷ 74 ***(100–200)***

Divide by a 2-digit divisor

The director of a bake sale asked volunteers to make packages of 2 dozen cookies. A total of 3,758 cookies were donated for the sale. How many packages will the volunteers make? ***156 packages***

➤ **How could you solve this word problem? How do you know?** ***Elicit that you can divide 3,758 by 24 because the total of 3,758 cookies will be distributed into sets of 2 dozen cookies and 2 dozen is equal to 24.***

1. Write 3,758 ÷ 24 in a division frame for display.

➤ **Where will you write the first digit in the quotient? Why?** ***In the Hundreds place; elicit that there are not enough one thousands (3) to distribute them in sets of 24; the 3 one thousands must be renamed as 30 hundreds to distribute 37 hundreds in sets of 24.*** Write small *x*'s above the dividend to mark the Hundreds, Tens, and Ones places.

➤ **How many sets of 24 can you make from 37? How do you know?** ***1; elicit that 2 sets of 24 equal 48.***

➤ **What is 37 hundreds ÷ 24?** ***1 hundred*** Write a 1 in the Hundreds place of the quotient.

➤ **What do you think the estimate range of the quotient is? Why?** ***Elicit 100–200; since there is a 1 in the Hundreds place of the quotient and there is still more to divide, the quotient will be greater than 100 but less than 200.***

2. Multiply and subtract the hundreds. ***13*** Point out that you need to rename the remaining 13 hundreds as 130 tens and then write the 5 from the original dividend to the right of the 13 tens to determine the new dividend.

➤ **How many tens are there to divide?** ***135 tens***

➤ **What could you do to make dividing 135 tens by 24 easier?** ***Elicit that you can round the divisor to 20, the nearest 10.*** Write 20 in a think cloud above the divisor.

(***Note:*** Some students may mentally determine the quotient of 135 ÷ 24 by thinking that 24 is only 1 less than 25 and using multiples of 25 (5 × 25 = 125) to determine that 135 tens ÷ 24 = 5 tens with 15 tens left to divide.)

3. Remind the students that the rounded divisor can help you determine what compatible numbers you can use to divide.

➤ **What near multiplication facts can help you determine compatible numbers to divide the tens?** ***2 × 6 = 12 and 2 × 7 = 14.***

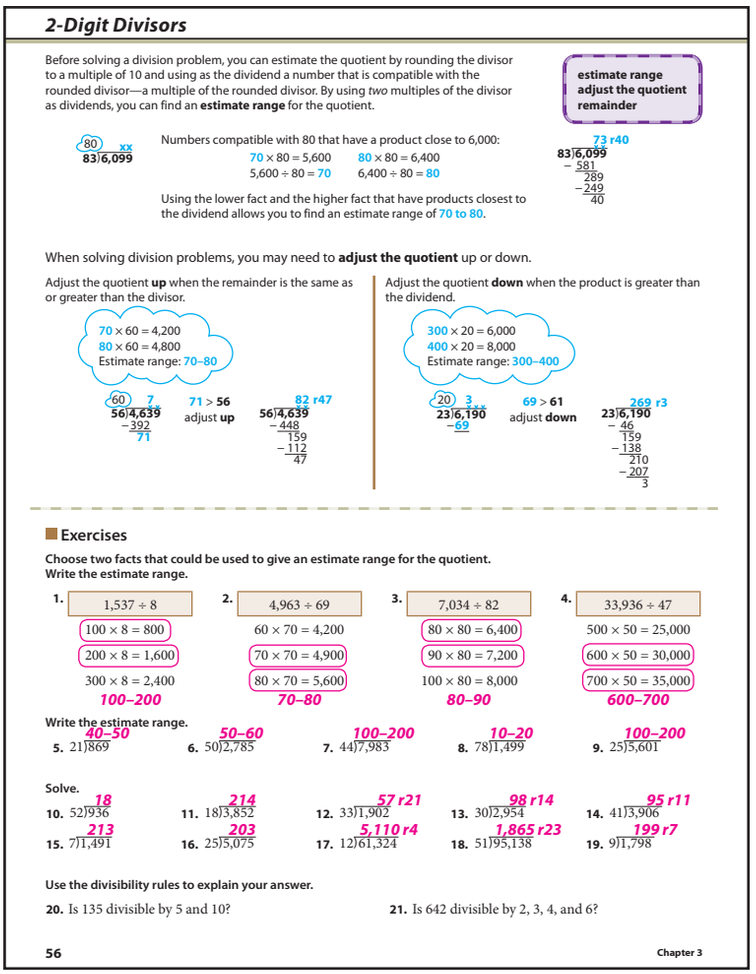
➤ **What compatible numbers could you use to divide the 135 tens? How do you know?** ***Elicit 20 and 120; the next multiple of 20 is 140, which is greater than 135.***

➤ **What is 135 tens ÷ 20? How do you know?** ***6 tens; elicit that 20 × 6 = 120, which is the multiple of 20 that is closest to 135 without being greater than 135.*** Write a 6 in the Tens place of the quotient.

4. Point out that you need to multiply by the exact divisor to find the exact quotient. Choose a student to multiply the tens. ***144***

Explain that when the number written in the quotient appears to be correct but the product of that number and the divisor is greater than the dividend, it is necessary to *adjust* the quotient *down*.

➤ **What should you adjust the quotient to? Why?** ***Elicit 5; answers may vary, but elicit that 5 is 1 less than 6, and 24 × 5 tens will give you a product that is less than 135 tens because 144 − 24 (1 set of 24) = 120.***



2-Digit Divisors

Before solving a division problem, you can estimate the quotient by rounding the divisor to a multiple of 10 and using as the dividend a number that is compatible with the rounded divisor—a multiple of the rounded divisor. By using *two* multiples of the divisor as dividends, you can find an **estimate range** for the quotient.

estimate range
adjust the quotient
remainder

80 xx
83)6,099

Numbers compatible with 80 that have a product close to 6,000:
70 × 80 = 5,600 80 × 80 = 6,400
5,600 ÷ 80 = 70 6,400 ÷ 80 = 80

Using the lower fact and the higher fact that have products closest to the dividend allows you to find an estimate range of 70 to 80.

73 r40
83)6,099
− 581
289
−249
40

When solving division problems, you may need to **adjust the quotient** up or down.

Adjust the quotient **up** when the remainder is the same as or greater than the divisor.

70 × 60 = 4,200
80 × 60 = 4,800
Estimate range: 70–80

60 7
56)4,639
−392
71

71 > 56
adjust up

82 r47
56)4,639
− 448
159
−112
47

Adjust the quotient **down** when the product is greater than the dividend.

300 × 20 = 6,000
400 × 20 = 8,000
Estimate range: 300–400

20 3xx
23)6,190
−69

69 > 61
adjust down

269 r3
23)6,190
− 46
159
−138
210
−207
3

Exercises

Choose two facts that could be used to give an estimate range for the quotient. Write the estimate range.

1. 1,537 ÷ 8	2. 4,963 ÷ 69	3. 7,034 ÷ 82	4. 33,936 ÷ 47
100 × 8 = 800	60 × 70 = 4,200	80 × 80 = 6,400	500 × 50 = 25,000
200 × 8 = 1,600	70 × 70 = 4,900	90 × 80 = 7,200	600 × 50 = 30,000
300 × 8 = 2,400	80 × 70 = 5,600	100 × 80 = 8,000	700 × 50 = 35,000
100–200	70–80	80–90	600–700

Write the estimate range.

5. 21)869 — 40–50
6. 50)2,785 — 50–60
7. 44)7,983 — 100–200
8. 78)1,499 — 10–20
9. 25)5,601 — 100–200

Solve.

10. 52)936 — 18
11. 18)3,852 — 214
12. 33)1,902 — 57 r21
13. 30)2,954 — 98 r14
14. 41)3,906 — 95 r11
15. 7)1,491 — 213
16. 25)5,075 — 203
17. 12)61,324 — 5,110 r4
18. 51)95,138 — 1,865 r23
19. 9)1,798 — 199 r7

Use the divisibility rules to explain your answer.

20. Is 135 divisible by 5 and 10?
21. Is 642 divisible by 2, 3, 4, and 6?

56 Chapter 3

When a dividend is not divisible by the divisor, there is a **remainder** in the quotient. Sometimes the remainder can be dropped because it is not needed to solve the word problem. Sometimes the quotient will need to be increased by 1 to account for the remainder.

Amanda has 22 baby carrots to give to 7 friends. How many carrots can she give to each friend?
22 ÷ 7 = 3 r1; 3 carrots

3 r1
7)22
−21
1

Amanda can give each friend 3 carrots, and there is 1 carrot remaining.

Timothy and 9 of his friends planned a camping trip. They will travel with 4 friends in each car. How many cars are needed?
10 ÷ 4 = 2 r2; 3 cars

2 r2
4)10
− 8
2

Only 8 boys will fit in 2 cars. A third car is needed to transport the 2 remaining boys.

Exercises

Solve. Explain what could be done with the remainders. *Explanation of remainders may vary.*

22. Three brothers were given 37 baseball cards. Each of them was to keep an equal number of the cards. How many cards did each boy receive? *37 ÷ 3 = 12 r1; 12 cards*
23. Mrs. Hagan planned to have 138 guests at the anniversary party. If each table can seat 8 people, how many tables are needed? *138 ÷ 8 = 17 r2; 18 tables*
24. How many bags of 2 dozen cookies can be filled from 1,500 cookies? *1,500 ÷ 24 = 62 r12; 62 bags*
25. The librarian is transferring books to the new bookshelves. She plans to divide 1,892 books equally among 37 shelves. How many books will be on each shelf? *1,892 ÷ 37 = 51 r5; 51 books*
26. The flower plantation had 380 flowers to plant in 15 rows. How many flowers will be in each row? *380 ÷ 15 = 25 r5; 25 flowers*
27. There are 1,000 marbles in each box. A store ordered 3 boxes. How many bags of 20 marbles each can be made? *(1,000 × 3) ÷ 20 = 3,000 ÷ 20 = 150; 150 bags*

Practice & Application

28. Write the number that is 1,000 *less than* 40,789. *39,789*
29. In which place is 4 located in 3,477,609? *Hundred Thousands place*
30. Write a multiplication equation for 2,117 + 2,117 + 2,117 + 2,117 = 8,468. *4 × 2,117 = 8,468*
31. Write three facts for the composite number 36. *Answers may vary. 3 × 12, 4 × 9, 6 × 6*
32. Solve the problem. Remember to solve parentheses first. (7 × 8) + (45 ÷ 3) = ___ *56 + 15 = 71*
33. Write 654.17 in expanded form with multiplication. *(6 × 100) + (5 × 10) + (4 × 1) + (1 × 0.1) + (7 × 0.01)*
34. Write a word problem about pumpkins for 198 ÷ 18. Use the divisor as the number of sets. *Answers will vary.*
35. Write the values of the expressions 2×9, 3^2, $2 + (3 \times 3)$, and 2^3 in least to greatest value. *2^3 [8], 3^2 [9], 2 + (3 × 3) [11], 2 × 9 [18]*
36. Solve each problem and explain why the answer labels are different.
360 popcorn balls in 20 baskets
360 popcorn balls with 20 in each basket
360 ÷ 20 = 18 popcorn balls in each basket
360 ÷ 20 = 18 baskets of popcorn balls

DID YOU KNOW

In 1979, meteorologists began naming tropical storms in the Atlantic Ocean with the names of men and women. There are 6 lists with 21 names on each list, a name for each letter of the alphabet, except for *Q*, *U*, *X*, *Y*, and *Z*. These lists are rotated every 6 years. The first 4 names on the list for 2011 were Arlene, Bret, Cindy, and Don. In what year will this list be repeated?

Complete DAILY REVIEW C on page 411.

Lesson 23 57

5. Erase the 6 in the Tens place of the quotient and write 5. Choose a student to multiply and subtract the tens. *15*
➤ **What will the new dividend be? How do you know?** *158; elicit that the remaining 15 tens rename as 150 ones, and there are 8 more ones in the original dividend to be divided.*
6. Follow a similar procedure to divide the ones. Choose a student to explain why the quotient for the ones needs to be adjusted down from 7 to 6. *Answers may vary, but guide the explanation to include that 6 is 1 less than 7, and 24 × 6 will give you a product that is less than 158 because 168 − 24 (1 set of 24) = 144.*
Multiply and subtract the ones. Write *r14* beside the quotient.
➤ **What does the quotient 156 represent?** *packages of 2 dozen cookies (the number of sets of 24 made from the 3,758 cookies.)*
the remainder? *14 extra cookies*
7. Read again the question in the word problem.
➤ **Is the remainder needed to answer the question? Why?** *No; elicit that the volunteers made as many sets of 2 dozen cookies as possible from the total number of cookies.*
➤ **What is the final answer to the word problem?** *156 packages*
8. Choose a student to demonstrate checking the division problem. *(24 × 156) + 14 = 3,758*
9. Follow a similar procedure for 2,585 ÷ 38, rounding the divisor to estimate the quotient *60–70* and to divide the tens. Explain that sometimes it is necessary to adjust the quotient when the remainder is equal to or greater than the divisor; the quotient is adjusted *up* in order to make the greatest number of equal sets possible. *68 r1*
10. Guide the students in solving and checking the following problems on paper. Remind them that if it is easy for them to think of numbers compatible with the divisor, they may not need to round the divisor before dividing. Point out that to solve 896 ÷ 11, they can think of the multiplication facts for 11, and in a problem such as 6,864 ÷ 31, they can easily divide and multiply the numbers in the divisor mentally. For the first and third problems, remind the students that an estimate gives you a good idea of what the exact answer will be, but sometimes the exact quotient, while still close to the estimate, will be outside the estimate range.

(20–30)	*(80–90)*	*(80–90)*	*(200–300)*
30 r4	*81 r5*	*78*	*221 r13*
28)844	11)896	93)7,254	31)6,864

Student Text pp. 56–57

(***Note***: *Assessment* available on Teacher's Toolkit CD.)

Lesson 24

Student Text pp. 58–59
Daily Review p. 411d

Objectives
- Divide a decimal by a 1-digit whole number
- Annex a zero to rename a decimal
- Check a division problem using multiplication
- Estimate a quotient
- Divide to find a quotient less than 1
- Express a fraction as an equivalent decimal
- Solve a division word problem
- Interpret a remainder

Teacher Materials
- Place Value Kit: large red ones, orange tenths, and purple hundredths

Divide a decimal by a 1-digit whole number
Annex a zero to rename a decimal

Mom gave Jackie and Logan 9 dollars to share fairly at the harvest festival. How much money will Jackie and Logan each have to spend? *$4.50* [BAT: 5b Sharing]

➤ **What equation can you write to find how much money Jackie and Logan each receive?** ***$9 ÷ 2 = ___***

1. Write for display $9 ÷ 2 = ___ as an equation and in a division frame.

➤ **Are you dividing to find the number in each set or the number of sets? How do you know?** ***The number in each set; elicit that Jackie and Logan represent 2 sets that will receive an equal amount of money.***

2. Display 9 large red ones from the Place Value Kit beside the problems. Draw 2 stick figures below the ones to represent Jackie and Logan; label the figures.
3. Choose a student to divide the 9 "dollars" (ones) fairly among the 2 children (sets).

➤ **How many "dollars" did each child receive?** ***4*** **How many dollars remain?** ***1***

Write 4 in the Ones place of the quotient in the division problem. Multiply and subtract to show the remaining 1 "dollar." Write *r1* beside the quotient.

➤ **What does the answer 4 r1 tell you?** ***Elicit that each child received 4 dollars with 1 dollar remaining.***

➤ **What do you think Jackie and Logan could do to share the remaining dollar fairly?** ***Elicit that they could divide the remaining dollar equally between them.***

4. Remind the students that a division problem can be written in fraction form. Explain that a remainder can be written as a fraction to show division. Since the remaining 1 "dollar" still needs to be divided by 2, you can write 1 ÷ 2 in fraction form. Erase *r1* and write $\frac{1}{2}$ beside the quotient.

➤ **What does the quotient $4\frac{1}{2}$ tell you?** ***Elicit that Jackie and Logan will each receive $4\frac{1}{2}$ dollars.***

➤ **How much money is equal to $\frac{1}{2}$ of a dollar?** ***50 cents***

➤ **Do you think writing the remainder as a fraction best answers the question of how much money Jackie and Logan each will receive?** ***Accept any reasonable answers, but elicit that $4\frac{1}{2}$ better answers how many dollars each child will receive, but change (50 cents) is usually expressed as a decimal.***

➤ **What could you do to divide the remaining one (1 dollar)?** ***Elicit that you can rename it as 10 tenths.***

5. Choose a student to rename the remaining one as 10 tenths and distribute the tenths fairly between the 2 children.

➤ **How many tenths (dimes) did each child receive?** ***5*** **How many remain?** ***0***

6. Write a decimal point to the right of the 9 in the dividend of the division problem. Remind the students that every whole number has an unseen decimal point because there is no decimal fraction. Explain that since you are dividing the remaining 1 dollar into parts of a dollar, you need to write a decimal point to the right of the Ones place.

➤ **Where in the quotient do you write the decimal point? Why?** ***to the right of the 4 because 4 is in the Ones place of the quotient*** Write a decimal point in the quotient.

7. Write a zero to the right of the decimal point in the original dividend and to the right of the 1 in the new dividend.

➤ **What is 10 tenths divided by 2?** ***5 tenths***

8. Write 5 in the Tenths place of the quotient. Multiply and subtract to complete the problem.

➤ **According to the quotient, how many dollars did each child receive?** ***4.5 (four and 5 tenths) dollars***

➤ **What is the value of 4.5 dollars? How do you know?** ***Elicit $4.50; 4.5 dollars is the same as $4\frac{5}{10}$, $4\frac{50}{100}$, or $4\frac{1}{2}$ dollars, which can be written as $4.50.***

➤ **How much money will Jackie and Logan each have to spend?** ***$4.50***

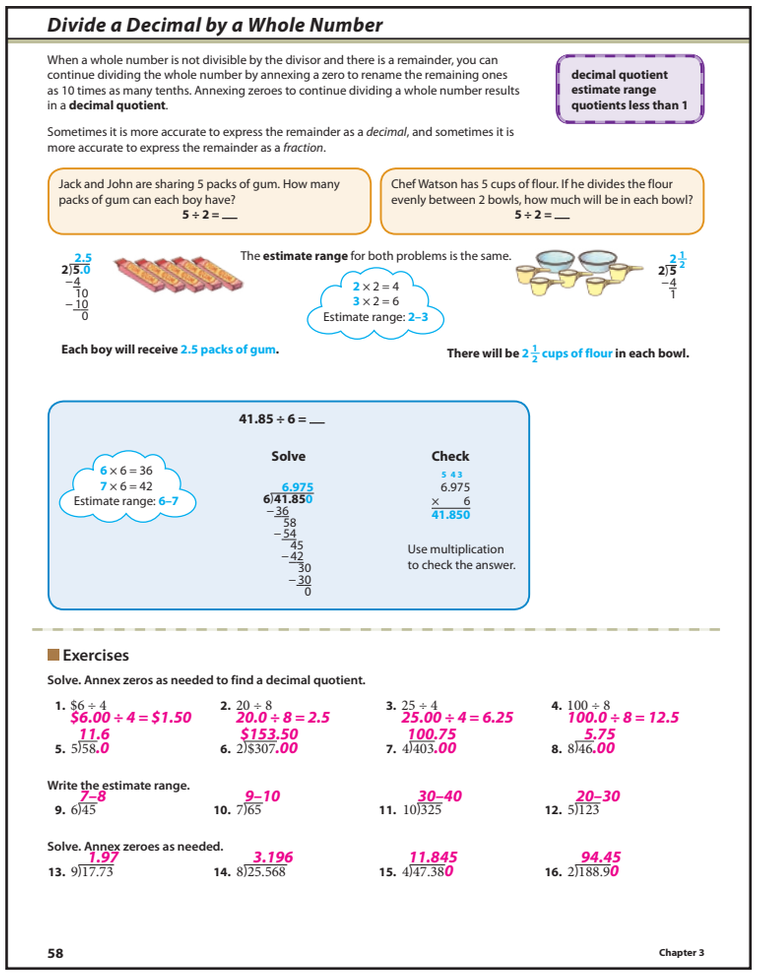
9. Explain that dividing a decimal is similar to dividing a whole number; each place of a decimal is divided and renamed as the next lesser place just as you divide and rename each place in a whole number. Remind them that annexing a zero to the right of the decimal point renames the new dividend as 10 times the number in the next lesser place—1 one is renamed as 10 tenths.

   Point out that the $9 in the original problem could have been in decimal form ($9.00).
10. Write $7.00 ÷ 4 in a division frame. Follow a similar procedure to find how much money can be shared fairly by 4 children. ***$1.75***
11. Guide the students in solving the following problems, annexing zeros as needed to find a decimal quotient. Remind them to write a zero in the Ones place of the quotient when there are no whole numbers. Use the Place Value Kit to demonstrate solving the problems. Instruct the students to check the first two problems. ***6 × 1.46 = 8.76 and 7 × 0.625 = 4.375*** For the last two problems, direct the students to multiply the divisor times a rounded quotient to determine if their answer is reasonable. Choose students to explain their answers. ***5 × 12 = 60—since 11.81 rounds up to 12, 11.81 is reasonably less than 12; 5 × 1 = 5—since 1.32 rounds down to 1, 1.32 is reasonably more than 1.***

1.46	*0.625*	*$11.81*	*1.32*
6)8.76	7)4.375	5)$59.05	5)6.6

Estimate a quotient

Use a procedure similar to the one used in Lesson 23 to guide the students in finding an estimate range for these problems. Lead discussions about where the dividend falls in the estimate



Divide a Decimal by a Whole Number

When a whole number is not divisible by the divisor and there is a remainder, you can continue dividing the whole number by annexing a zero to rename the remaining ones as 10 times as many tenths. Annexing zeroes to continue dividing a whole number results in a **decimal quotient**.

decimal quotient
estimate range
quotients less than 1

Sometimes it is more accurate to express the remainder as a *decimal*, and sometimes it is more accurate to express the remainder as a *fraction*.

Jack and John are sharing 5 packs of gum. How many packs of gum can each boy have?
5 ÷ 2 = ___

Chef Watson has 5 cups of flour. If he divides the flour evenly between 2 bowls, how much will be in each bowl?
5 ÷ 2 = ___

2.5
2)5.0
−4
10
−10
0

The **estimate range** for both problems is the same.

2 × 2 = 4
3 × 2 = 6
Estimate range: 2–3

2 1/2
2)5
−4
1

Each boy will receive 2.5 packs of gum.

There will be 2 1/2 cups of flour in each bowl.

41.85 ÷ 6 = ___

6 × 6 = 36
7 × 6 = 42
Estimate range: 6–7

Solve

6.975
6)41.850
−36
58
−54
45
−42
30
−30
0

Check

5 4 3
6.975
× 6
41.850

Use multiplication to check the answer.

Exercises

Solve. Annex zeros as needed to find a decimal quotient.

1. $6 ÷ 4 — *$6.00 ÷ 4 = $1.50*
2. 20 ÷ 8 — *20.0 ÷ 8 = 2.5*
3. 25 ÷ 4 — *25.00 ÷ 4 = 6.25*
4. 100 ÷ 8 — *100.0 ÷ 8 = 12.5*
5. 5)58.0 — *11.6*
6. 2)$307.00 — *$153.50*
7. 4)403.00 — *100.75*
8. 8)46.00 — *5.75*

Write the estimate range.

9. 6)45 — *7–8*
10. 7)65 — *9–10*
11. 10)325 — *30–40*
12. 5)123 — *20–30*

Solve. Annex zeroes as needed.

13. 9)17.73 — *1.97*
14. 8)25.568 — *3.196*
15. 4)47.380 — *11.845*
16. 2)188.90 — *94.45*

58 Chapter 3

Remember that a division problem can be written in fraction form. You can find the equivalent decimal value of a proper fraction by dividing the numerator by the denominator, annexing zeros as needed. The **quotient** will always be **less than 1**.

1/4 = 1 ÷ 4

0.25
4)1.00
−8
20
−20
0

Exercises

Find the equivalent decimal for the fraction.

17. 2/4 — *0.5*
18. 4/8 — *0.5*
19. 2/10 — *0.2*
20. 1/8 — *0.125*

Determine the quotient using estimation. Choose the correct answer. Use multiplication to check your answer.

21.	17.6 ÷ 2	(8.8)	88.8	0.88
22.	261.1 ÷ 5	(52.22)	5.222	522.2
23.	124.92 ÷ 6	2.082	208.2	(20.82)
24.	84.6 ÷ 9	0.94	(9.4)	94
25.	734.4 ÷ 8	0.918	(91.8)	9.18
26.	12.93 ÷ 3	(4.31)	403.1	43.1

Solve. Write the remainder as a fraction.

27. Seventeen candy bars were divided equally among 4 friends. How many candy bars did each friend get?
17 ÷ 4 = 4 1/4 candy bars

28. At a dessert station, pies were cut into 8 slices each. Thirty-three slices of pie were served. How many pies were eaten?
33 ÷ 8 = 4 1/8 pies

Practice & Application

29. One side of a square measures 7 inches. Which expression gives the perimeter of the square?
7^4 | 7 × 7 | (4 × 7)

30. In which number is the value of 9 the same as in 196,342?
900,000 | 19,634 | (90,530)

31. Which two numbers are divisible by 6?
(384) | (498) | 542

32. Choose the product of 100 × 389.
3,890 | (38,900) | 389,000

33. Choose the estimated sum of 63,095 and 29,486 using front-end estimation.
82,000 | (92,000) | 102,000

34. Write two related multiplication equations and two related division equations for the part-whole model.

186		
62	62	62

3 × 62 = 186
62 × 3 = 186
186 ÷ 62 = 3
186 ÷ 3 = 62

Complete DAILY REVIEW d on page 411.

Lesson 24 59

range; e.g., 35.64 is closer to 36 than 32, so the quotient will be closer to 9 than 8.

35.64 ÷ 4 *compatible numbers: 4 × 8 = 32 and 4 × 9 = 36; estimate range: 8–9; the dividend 35.64 is closer to 36 than 32, so the quotient will be closer to 9 than 8.*

0.752 ÷ 4 *compatible numbers: 4 × 0.1 = 0.4 and 4 × 0.2 = 0.8; estimate range: 0.1–0.2; the dividend 0.752 is closer to 0.8 than 0.4, so the quotient will be closer to 0.2 than 0.1.*

$85.70 ÷ 5 *compatible numbers: 5 × 10 = 50 and 5 × 20 = 100; estimate range: $10–$20; the dividend $85.70 is closer to 100 than 50, so the quotient will be closer to 20 than 10.*

Divide to find a quotient less than 1

1. Write $\frac{1}{4}$ for display. Explain that because the bar in a fraction means division, you can divide the terms of a fraction to find an equivalent decimal. Remind the students that proper fractions and decimal fractions have values less than 1.

➤ **How can you read this fraction?** *Elicit one-fourth, 1 out of 4, and 1 divided by 4.*

2. Choose a student to write 1 ÷ 4 in a division frame and solve the problem.
(***Note:*** You may choose to demonstrate each step using the Place Value Kit.)

➤ **What decimal is equal to the fraction $\frac{1}{4}$?** *0.25* Write $\frac{1}{4}$ = 0.25 for display.

3. Follow a similar procedure for these fractions. Continue to display the equivalent statements.

$\frac{1}{2}$ = *0.5* $\frac{1}{5}$ = *0.2* $\frac{1}{8}$ = *0.125*
$\frac{3}{4}$ = *0.75* $\frac{2}{4}$ = *0.5* $\frac{3}{5}$ = *0.6*

Mrs. Quinn has 3 cups of pecans. She wants to use an equal amount of pecans in each of 4 pies. How many cups of pecans will she use for each pie? *$\frac{3}{4}$ cup*

➤ **What equation would help you find how many cups of pecans will be in each pie?** *3 ÷ 4 = ___*

4. Choose a student to write 3 ÷ 4 in a division frame and solve the problem. *0.75*

5. Direct attention to the equivalent value for 0.75 written for display ($\frac{3}{4}$ = 0.75). Guide a discussion about the better answer for the problem. Elicit that when baking, you usually use a fraction rather than a decimal to measure a part of a cup.

6. Repeat the procedure for this word problem. Elicit that the cost of an item less than $1.00 is written in decimal form to the Hundredths place.

Mr. Jones took 5 boys to the ball game and paid a total of $4.00 for a drink for each boy. How much did each drink cost? *4 ÷ 5 = $0.80*

Student Text pp. 58–59

Lesson 25

Student Text pp. 60–61
Daily Review p. 412e

Objectives
- Determine an average (mean) or a unit rate
- Divide a decimal by a 2-digit whole number
- Estimate a quotient
- Divide to find a quotient less than 1
- Annex a zero to rename a decimal
- Solve a division word problem
- Interpret a remainder
- Express a fraction as an equivalent decimal

Teacher Materials
- Place Value Kit: ones, tenths, and hundredths
- Christian Worldview Shaping, pages 7–9 (CD)

Student Materials
- Christian Worldview Shaping, page 8 (CD)

Teach for Understanding

Determine an average (mean) or a unit rate

Julie took 5 tests in math class this quarter. On one test the teacher gave one-half of a point (0.5) if part of an answer was correct. Julie's test scores are 97.5; 90; 89; 92; and 91. What is her average test score? ***92***

➤ **How can you find Julie's average test score?** ***Add the test scores to find a total and then divide the sum equally among the number of test scores that were added.***

1. Choose a student to add the scores for display as other students add them on paper. ***459.5***

➤ **What is the number of tests by which you need to divide the total number of points? How do you know?** ***5; 5 test scores were added together.***

2. Select a student to divide 459.5 by 5 for display as other students do the division on paper. ***91.9***

➤ **What is Julie's average test score rounded to the nearest whole number?** ***92***

➤ **Does an average score of 92 seem reasonable?** ***Instruct the students to think of various ways to determine whether 92 is a reasonable answer, and elicit that it is reasonable.***

Jackie babysat for 7 hours for the Kruger family. They paid her $50. Approximately how much money did Jackie earn in 1 hour? ***$7.14*** [BAT: 2e Work]

➤ **How can you find the amount of money Jackie earned in 1 hour?** ***Divide the total amount she earned by the number of hours she worked.***

3. Explain that when you are finding the average amount of money that Jackie earned in 1 hour, you are finding her *unit rate* of pay per hour.

➤ **Do you need to add anything to find the total earned in 7 hours? Why?** ***No; the total earned ($50) is information given in the problem.***

4. Write $50 ÷ 7 in a division frame for display.

➤ **How can you determine an estimate range of pay per hour?** ***Elicit that you can think of 7 × $7 = $49 and 7 × $8 = $56; Julie's unit rate will be between $7 and $8, but closer to $7 because $50 is closer to $49 than to $56.***

➤ **Since the amount will be between $7 and $8, what place do you need to divide to? Why?** ***Elicit that if the decimal quotient does not end, you will need to divide to the One Thousandths place and round to the nearest hundredth (cent).***

5. Choose a student to demonstrate dividing $50 by 7 as the others students do the division on paper. Give guidance as needed. ***7.142 rounds to 7.14*** Point out that although the decimal quotient did not *terminate* (end), it can be rounded to give a close answer.

➤ **Approximately how much money did Jackie earn per hour?** ***$7.14***

Divide a decimal by a 2-digit whole number

1. Follow a procedure similar to the one used in Lesson 24 to solve the following word problem, annexing zeros to round to the nearest hundredth; use the Place Value Kit to picture the problem as you demonstrate the long division. Elicit that solving a division problem with a 2-digit divisor is similar to solving a division problem with a 1-digit divisor; round the divisor to the nearest ten and find compatible numbers to divide each place.

In a race Carol rode a bike for 12 minutes and covered 3.72 miles. What part of a mile did she average for each minute? ***3.72 ÷ 12 = 0.31 mile***

2. Follow a similar procedure to solve these word problems without manipulatives.

George worked 38 hours last week and earned $355.30. How much money did George earn per hour? ***$355.30 ÷ 38 = $9.35 per hour*** [BAT: 2e Work]

There are 91.08 inches of ribbon per roll. It takes 36 inches to make a bow. How many bows can be made from 1 roll of ribbon? ***91.08 ÷ 36 = 2.53 bows; 2 bows***

3. Ask the following questions as you guide the students in solving this word problem on paper; divide to the Hundredths place. Demonstrate each step.

During his physical education class, Orson ran a total of 1.5 miles in 11 minutes. How many tenths of a mile did he average per minute?

➤ **How can you find how many tenths of a mile Orson ran per minute?** ***Divide the total distance Orson ran by the number of minutes he ran.***

➤ **What equation can you write?** ***1.5 ÷ 11 = ___ miles per minute***

➤ **How could you estimate this answer?** ***Accept any reasonable answer, but elicit that he ran 15 tenths of a mile in 11 minutes, which is a little more than 1 tenth of a mile per minute.***

➤ **To what place do you need to divide to find an answer to the nearest tenth of a mile? Why?** ***Elicit that you need to divide to the Hundredths place so that you can round to the nearest tenth.***

Choose a student to write the rounded answer in the equation. ***0.1*** Explain that when the answer has been rounded, the equal sign must be replaced with a sign that means "is approximately equal to." Erase the sign and replace it with ≈. Point out that the rounded number tells you that Orson ran an average of approximately 0.1 mile per minute; he did not run exactly 0.1 mile per minute.

4. Guide the students in solving this word problem, annexing zeros as needed to divide to the One Thousandths place and then rounding to the nearest hundredth (cent).

Divide a Decimal by 2-Digit Divisors

An **average** is found by adding two or more quantities in a set and then dividing that total by the number of addends. Sometimes the total is given and only the division step is necessary.

When a number is not divisible by the divisor, you can continue dividing by annexing zeros in the dividend and **rounding the quotient** to a given place. The symbol ≈ means **"is approximately equal to"** and is used to show that the quotient was rounded.

average
rounding the quotient
≈ "is approximately equal to"

Mom bought a tin of popcorn on sale. The sale price was 2 tins for $10.25. How much did she pay for one tin of popcorn if the price was rounded to the nearest hundredth?

$10.25 ÷ 2 ≈ $5.13

$5.125
2)$10.250
−10
02
− 2
05
− 4
10
−10
0

Joel made a 35-yard field goal, a 28-yard field goal, and a 41-yard field goal at the Friday night football game. Round to the nearest tenth of a yard to find his average field goal length for the game.

104 ÷ 3 ≈ 34.7 yd

34.66
3)104.00
− 9
14
−12
20
−18
20
−18
2

It took 16 gallons to fill up the gas tank in Dad's truck. The cost of the gas was $51.92. Round to the nearest hundredth to find the price of each gallon of gas.

$51.92 ÷ 16 ≈ $3.25

$3.245
16)$51.920
−48
39
−32
72
−64
80
−80
0

Exercises

Solve. Round to the nearest hundredth.

1. 7)100.000 — 14.285 ≈ 14.29
2. 37)60.000 — 1.621 ≈ 1.62
3. 18)244.000 — 13.555 ≈ 13.56
4. 23)456.000 — 19.826 ≈ 19.83
5. 19)864.000 — 45.473 ≈ 45.47
6. 4)$4.250 — $1.062 ≈ $1.06
7. 17)$61.300 — $3.605 ≈ $3.61
8. 37)$34.180 — $0.923 ≈ $0.92
9. 13)$11.05 — $0.85
10. 40)$79.350 — $1.983 ≈ $1.98

Solve.

11. Lydia planted 18 seeds in a planter. The planter was 64 centimeters long. If the seeds were equally spaced, how far apart were the seeds placed? Round to the nearest tenth for the answer. *64 ÷ 18 = 3.55; 3.6 cm*
12. It takes 4 yards of fabric to make each angel robe for the Christmas program. How many robes can be made from 39 yards of fabric? *39 ÷ 4 = 9.75; 9 robes*
13. Ava bought a package of 4 batteries for $2.36. Ethan bought a package of 2 batteries for $1.48. Find the cost of 1 battery in each package to determine which package is the better buy. *$2.36 ÷ 4 = $0.59; $1.48 ÷ 2 = $0.74; The 4-battery pack is the better buy.*
14. There are 40 questions on the math review sheet Mr. Watts gave his class. The review is worth 100 points. How many points is each question worth? *100 ÷ 40 = 2.5 points each*
15. Use the answer for problem 14 to answer this question. What would Jacob's score be if he missed three questions on the math review sheet? *3 × 2.5 = 7.5; 100 − 7.5 = 92.5*
16. The camera shop had a sale on digital cameras. The sale prices on three different cameras were $121.95, $132, and $149.99. To the nearest hundredth, what was the average cost of the cameras? *$121.95 + $132.00 + $149.99 = $403.94; $403.94 ÷ 3 = $134.646; $134.65*

Write the estimate range.

17. 2)93 — 40–50
18. 18)244 — 10–20
19. 34)1,789 — 50–60
20. 56)619 — 10–20

Write a division equation to find the missing factor. Solve.

21. $n \times 84 = 420$ — $420 \div 84 = 5$
22. $55 \times n = 605$ — $605 \div 55 = 11$
23. $3{,}408 = 16 \times n$ — $3{,}408 \div 16 = 213$
24. $264 = n \times 11$ — $264 \div 11 = 24$

Solve. Annex zeros as needed to find a decimal quotient.

25. $\frac{357}{7}$ — 51
26. $\frac{624}{12}$ — 52
27. $\frac{186}{4}$ — 46.5
28. 12.3 ÷ 82 — 0.15
29. 2,925 ÷ 18 — 162.5
30. 390 ÷ 40 — 9.75
31. 16)240.560 — 15.035
32. 11)1,782 — 162
33. 3)$117.39 — $39.13

Solve.

34. Pencils come in different bulk amounts.

yellow pencils	520
tie-dye pencils	540
rain forest pencils	560

Which pencils could the principal order and divide evenly among 6 classes? *tie-dye; 540 ÷ 6 = 90 pencils*

35. If the principal ordered one bulk amount of each kind of pencil, how many pencils would each of the 6 classes receive? *520 + 540 + 560 = 1,620; 1,620 ÷ 6 = 270 pencils*

36. Find the average number of square miles in the three smallest states. Round to the nearest tenth of a mile.

Rhode Island	1,213 square miles
Delaware	2,026 square miles
Connecticut	5,006 square miles

37. Does Connecticut have more or fewer square miles than Rhode Island and Delaware combined? *1,213 + 2,026 = 3,239; 5,006 − 3,239 = 1,767 square miles more*

Practice & Application

38. Write 1,309,400 in expanded form. *1,000,000 + 300,000 + 9,000 + 400*
39. Use the Distributive Property to solve 17 × 30. *(10 × 30) + (7 × 30) = 300 + 210 = 510*
40. Write the value of 8^3. *8 × 8 × 8 = 512*
41. How many zeros are in the standard form of 10^6? Write the standard form. *6; 1,000,000*
42. Write *thirty and seven hundredths* in standard form. *30.07*
43. List the numbers that 1,396 is divisible by: 2, 3, 4, 5, or 6. *2 and 4*

44. Complete the division problem by filling in the boxes. *Hint:* When the divisor is multiplied by the first digit of the quotient, it equals a 3-digit number. When the divisor is multiplied by the 8 in the quotient, it equals a 2-digit number.

90, 809
12)1,089,708
−108
97
− 96
108
− 108
0

36. *1,213 + 2,026 + 5,006 = 8,245; 8,245 ÷ 3 = 2,748.3 square miles*

Complete DAILY REVIEW 6 on page 412.

Lori has $67 to buy Christmas presents for 12 family members. If she spends the same amount for each person's gift, how much money can Lori spend for each gift? *$5.583; $67 ÷ 12 ≈ $5.58* [BAT: 5b Giving]

➤ **Is $5.58 a reasonable answer? Why?** *Accept any reasonable answers, but elicit that $5.58 is reasonable because 12 × $5 = $60 and 12 × $6 = $72; $67.00 is between $60 and $72.*

5. Guide the students in solving these word problems and interpreting the decimal remainders.

Mrs. White wants to serve cider and donuts to a group of teenagers. If she serves the cider in 12-ounce servings, how many servings can she get from each gallon of cider (128 fluid ounces)? *128 ÷ 12 ≈ 10.67; 10 servings; elicit that only 10 12-ounce servings are possible from each gallon.*

Mr. Matthews has $25 to spend on his 45 band students. He wants to purchase one clip for each student's music stand to hold music in place. How much can he spend for each clip? *$0.555; $25 ÷ 45 ≈ $0.55; elicit that only $0.55 can be spent for each clip so that the total amount spent does not exceed $25.*

6. **Christian Worldview Shaping (CD)**

Express a fraction as an equivalent decimal

1. Write $\frac{12}{16}$ for display. Remind the students that proper fractions and decimal fractions have values less than 1 and that the bar in a fraction means division, so they can divide the terms of a fraction to find an equivalent decimal.

➤ **How can you read this fraction?** *Elicit twelve sixteenths, 12 out of 16, and 12 divided by 16.*

2. Choose a student to write 12 ÷ 16 for display in a division frame and solve it.

➤ **What decimal is equal to the fraction $\frac{12}{16}$?** *0.75* Write $\frac{12}{16} = 0.75$ for display.

3. Follow a similar procedure for these fractions.

$\frac{25}{50} = 0.5$ $\quad \frac{11}{55} = 0.2$ $\quad \frac{12}{32} = 0.375$
$\frac{60}{80} = 0.75$ $\quad \frac{13}{26} = 0.5$ $\quad \frac{15}{25} = 0.6$

Student Text pp. 60–61

Lesson 26

Student Text pp. 62–63
Daily Review p. 412f

Objectives
- Divide by a power of 10
- Divide a whole number by a 1-, 2- or 3-digit divisor
- Divide a decimal by a 1-, 2- or 3-digit whole number
- Estimate a quotient
- Solve a division word problem
- Interpret a remainder

Teach for Understanding

Divide by a power of 10

1. Write these multiplication equations for display. Choose students to solve the equations using mental math.
   $10 \times 2 =$ ***20*** $10 \times 32 =$ ***320*** $10 \times 752 =$ ***7,520***

➤ **Where is the unseen decimal point in a whole number?** ***to the right of the Ones place***

➤ **What was the movement of the unseen decimal point when each whole number was multiplied by 10?** ***The decimal point moved 1 place to the right in the number.***

2. Point out that the movement of the unseen decimal point 1 place to the right renames each digit in the whole number as 10 times its original value.

➤ **Since division is the inverse operation of multiplication, what do you predict about the movement of the unseen decimal point when you divide a whole number by 10?** ***Elicit that the decimal point will move 1 place to the left, renaming each digit as $\frac{1}{10}$ of its original value.***

3. Select students to divide these whole numbers by 10, using mental math to move the decimal point 1 place to the left.
   $30 \div 10 =$ ***3*** $160 \div 10 =$ ***16*** $3{,}950 \div 10 =$ ***395***
   Point out that when you divide a whole number by 10, the movement of the unseen decimal point 1 place to the left renames each digit to the next lesser place, making the quotient $\frac{1}{10}$ the value of the dividend.
4. Write these equations for display.
   $10 \times 3.4 =$ ***34*** $10 \times 9.61 =$ ***96.1*** $10 \times 0.825 =$ ***8.25***
   $29 \div 10 =$ ***2.9*** $578 \div 10 =$ ***57.8*** $16{,}293 \div 10 =$ ***1,629.3***

➤ **How do you think you could use mental math to complete these problems?** ***Elicit that when you multiply by 10 the decimal point moves 1 place to the right, and when you divide by 10 the decimal point moves 1 place to the left.***

5. Direct the students to use mental math to solve the equations and to write the answers on paper. Choose students to write the answers for display and allow other students to check their answers.
6. Follow a similar procedure for these equations. Guide the students to the conclusion that each quotient is $\frac{1}{100}$ of the value of the dividend; the decimal point in the quotient is 2 places to the left of its position in the dividend and each digit in the quotient is two places to the right of its position in the dividend. Elicit that zeros may need to be annexed to the left of the digits in the quotient.
   $500 \div 100 =$ ***5*** $8{,}200 \div 100 =$ ***82***
   $140.6 \div 100 =$ ***1.406*** $32.15 \div 100 =$ ***0.3215***
7. Repeat the procedure for these equations. Guide the students to the conclusion that the quotient will be $\frac{1}{1{,}000}$ of the dividend and that one or more zeros may need to be annexed to the left of the digits in the quotient.
   $35{,}000 \div 1{,}000 =$ ***35*** $892.2 \div 1{,}000 =$ ***0.8922***
   $45.8 \div 1{,}000 =$ ***0.0458***
8. Guide the students in answering this word problem.

> Alma plans to serve 0.2 pound of potato salad to each of 100 ladies at the Mother's Day banquet. A deli donated 20.5 pounds of potato salad for the banquet. How can Alma use mental math to determine if there are enough 0.2 pound servings in the donated amount? ***20.5 ÷ 100 = 0.205 lb*** (***Note***: Accept $100 \times 0.2 = 20$ lb, but emphasize the division process.)

➤ **Is there enough potato salad for each lady to be served 0.2 pounds? How do you know?** ***Yes; elicit that there are one hundred 0.2 lb servings in the 20.5 lbs of donated potato salad with 0.5 lb left over.***

Estimate and solve a division word problem

1. Direct the students to estimate the answer to this word problem and solve. Allow them to use mental math to determine the estimate. Give guidance as needed.

> The Robinson family's grocery bill for 8 weeks was $792.26. What is the average amount that the family spent on groceries each week? ***Accept any correct estimates; $792.26 ÷ 8 ≈ $99.03***

2. Select a student to write the division equation for the word problem. Select other students to explain their estimates. Lead a discussion to compare the estimates to the exact answer; include the method of estimating that resulted in a closer estimate.
3. Choose a student to demonstrate checking the division equation using multiplication. Compare the product to the dividend. Point out that when checking a rounded quotient there will be a slight difference between the product and the exact dividend.
4. Follow a similar procedure for this word problem.

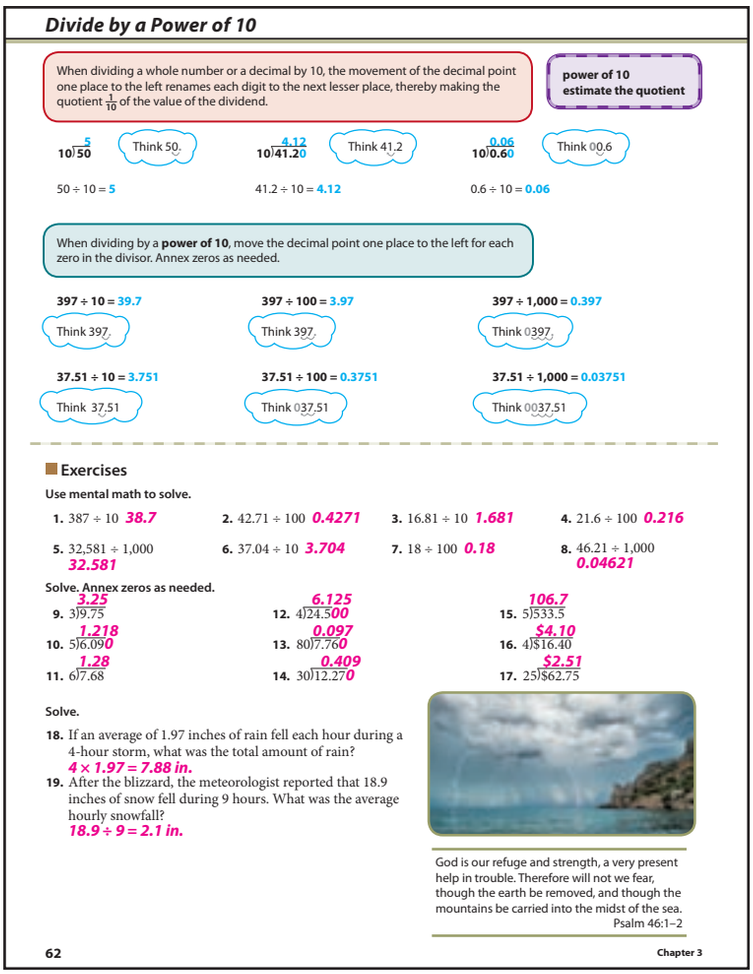
> The total distance of the bike ride for the fundraising event is 318 city blocks. If 22 city blocks equal 1 mile, how many miles was the bike ride? ***318 ÷ 22 ≈ 14.45 miles***

Divide by a 3-digit divisor

> A company shipped 28,125 boxes of greeting cards in cases that held 125 boxes each. How many cases did the company ship? ***28,125 ÷ 125 = 225 cases***

➤ **What operation can you use to find how many cases were shipped?** ***division***

1. Choose a student to write the problem in equation form and in a division frame. ***28,125 ÷ 125 = ___***
2. Direct attention to the 3-digit divisor. Elicit that solving a problem with a 3-digit divisor is similar to solving a problem with a 2-digit divisor; round the divisor to the nearest hundred and think of compatible numbers to divide each place.



Divide by a Power of 10

When dividing a whole number or a decimal by 10, the movement of the decimal point one place to the left renames each digit to the next lesser place, thereby making the quotient $\frac{1}{10}$ of the value of the dividend.

power of 10
estimate the quotient

$10\overline{)50}$ Think 50. $\quad 5$

$10\overline{)41.20}$ Think 41.2 $\quad 4.12$

$10\overline{)0.60}$ Think 00.6 $\quad 0.06$

$50 \div 10 = 5$ $\quad 41.2 \div 10 = 4.12$ $\quad 0.6 \div 10 = 0.06$

When dividing by a **power of 10**, move the decimal point one place to the left for each zero in the divisor. Annex zeros as needed.

397 ÷ 10 = 39.7 Think 397.

397 ÷ 100 = 3.97 Think 397.

397 ÷ 1,000 = 0.397 Think 0397.

37.51 ÷ 10 = 3.751 Think 37.51

37.51 ÷ 100 = 0.3751 Think 037.51

37.51 ÷ 1,000 = 0.03751 Think 0037.51

Exercises

Use mental math to solve.

1. 387 ÷ 10 *38.7*
2. 42.71 ÷ 100 *0.4271*
3. 16.81 ÷ 10 *1.681*
4. 21.6 ÷ 100 *0.216*
5. 32,581 ÷ 1,000 *32.581*
6. 37.04 ÷ 10 *3.704*
7. 18 ÷ 100 *0.18*
8. 46.21 ÷ 1,000 *0.04621*

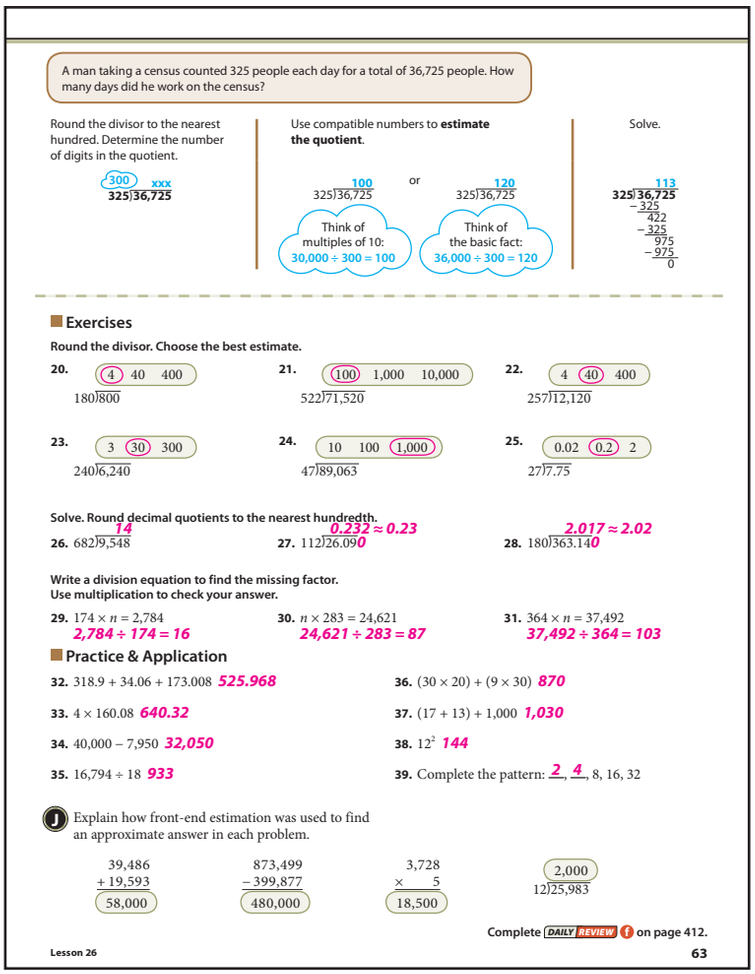
Solve. Annex zeros as needed.

9. $3\overline{)9.75}$ *3.25*
10. $5\overline{)6.090}$ *1.218*
11. $6\overline{)7.68}$ *1.28*
12. $4\overline{)24.500}$ *6.125*
13. $80\overline{)7.760}$ *0.097*
14. $30\overline{)12.270}$ *0.409*
15. $5\overline{)533.5}$ *106.7*
16. $4\overline{)\$16.40}$ *\$4.10*
17. $25\overline{)\$62.75}$ *\$2.51*

Solve.

18. If an average of 1.97 inches of rain fell each hour during a 4-hour storm, what was the total amount of rain?
4 × 1.97 = 7.88 in.
19. After the blizzard, the meteorologist reported that 18.9 inches of snow fell during 9 hours. What was the average hourly snowfall?
18.9 ÷ 9 = 2.1 in.

God is our refuge and strength, a very present help in trouble. Therefore will not we fear, though the earth be removed, and though the mountains be carried into the midst of the sea.
Psalm 46:1–2



A man taking a census counted 325 people each day for a total of 36,725 people. How many days did he work on the census?

Round the divisor to the nearest hundred. Determine the number of digits in the quotient.

$325\overline{)36,725}$ 300, xxx

Use compatible numbers to **estimate the quotient**.

$325\overline{)36,725}$ $\quad 100$ Think of multiples of 10: 30,000 ÷ 300 = 100

or

$325\overline{)36,725}$ $\quad 120$ Think of the basic fact: 36,000 ÷ 300 = 120

Solve.

$325\overline{)36,725}$ $\quad 113$

-325
422
-325
975
-975
0

Exercises

Round the divisor. Choose the best estimate.

20. $180\overline{)800}$ (4) 40 400
21. $522\overline{)71,520}$ (100) 1,000 10,000
22. $257\overline{)12,120}$ 4 (40) 400
23. $240\overline{)6,240}$ 3 (30) 300
24. $47\overline{)89,063}$ 10 100 (1,000)
25. $27\overline{)7.75}$ 0.02 (0.2) 2

Solve. Round decimal quotients to the nearest hundredth.

26. $682\overline{)9,548}$ *14*
27. $112\overline{)26.090}$ *0.232 ≈ 0.23*
28. $180\overline{)363.140}$ *2.017 ≈ 2.02*

Write a division equation to find the missing factor. Use multiplication to check your answer.

29. 174 × *n* = 2,784 *2,784 ÷ 174 = 16*
30. *n* × 283 = 24,621 *24,621 ÷ 283 = 87*
31. 364 × *n* = 37,492 *37,492 ÷ 364 = 103*

Practice & Application

32. 318.9 + 34.06 + 173.008 *525.968*
33. 4 × 160.08 *640.32*
34. 40,000 − 7,950 *32,050*
35. 16,794 ÷ 18 *933*
36. (30 × 20) + (9 × 30) *870*
37. (17 + 13) + 1,000 *1,030*
38. 12^2 *144*
39. Complete the pattern: *2*, *4*, 8, 16, 32

J Explain how front-end estimation was used to find an approximate answer in each problem.

$\begin{array}{r} 39{,}486 \\ +\ 19{,}593 \\ \hline 58{,}000 \end{array}$ $\quad \begin{array}{r} 873{,}499 \\ -\ 399{,}877 \\ \hline 480{,}000 \end{array}$ $\quad \begin{array}{r} 3{,}728 \\ \times\ \quad 5 \\ \hline 18{,}500 \end{array}$ $\quad 12\overline{)25{,}983}$ 2,000

Complete DAILY REVIEW 1 on page 412.

➤ **How many digits will be in the quotient? How do you know?** *3; elicit that there are not enough ten thousands (2) or one thousands (28) to divide them by 125 unless you rename them as 281 hundreds, enough hundreds to be divided by 125.*

➤ **How can you estimate this problem?** *Accept any correct answers, but elicit that you can round the divisor to its greatest place value and then determine an estimate range: 100 × 200 = 20,000 and 100 × 300 = 30,000; 200–300.*
(*Note*: 100 × 280 = 28,000; 280 is also a reasonable estimate.)

3. Use the following procedure to guide the students in solving the problem on paper.

➤ **What is 281 hundreds ÷ 125? How do you know?** *2 hundreds; answers will vary, but you may want to elicit multiples of 125 (125, 250, 375).*

4. Write 2 in the Hundreds place of the quotient. Remind the students to multiply by the exact divisor.

➤ **What is 2 hundreds × 125?** *250 hundreds*
Write 250 below the dividend and subtract.

➤ **How many hundreds remain?** *31*

5. Write the 2 in the Tens place of the dividend to the right of the remaining 31 hundreds: 312 tens to divide.

➤ **What is 312 tens ÷ 125? How do you know?** *2 tens; accept any reasonable answer, but elicit that 3 × 125 = 375, which is more than 312, so you must adjust down.*
Write 2 in the Tens place of the quotient. Multiply and subtract.

➤ **How many tens remain?** *62*

6. Write the 5 in the Ones place of the dividend to the right of the remaining 62 tens: 625 ones to divide.

➤ **What is 625 ones ÷ 125? How do you know?** *5 ones; accept any reasonable answer, but elicit that 6 × 125 = 750, which is more than 625, and 5 × 125 = 625.*
Write 5 in the Ones place of the quotient. Multiply and subtract.

➤ **How many cases of greeting cards did the company ship?** *225 cases*
Complete the equation.

➤ **Is 225 a reasonable answer? How do you know?** *Yes, 225 is within the estimate range of 200–300.*

7. Follow a similar procedure to guide the students in solving these problems.

$231\overline{)12{,}936}$ *56* $\qquad 125\overline{)537.5}$ *4.3*

8. Read this word problem aloud. Direct the students to solve the problem on paper and then interpret the remainder to answer the question. Reread the word problem as needed.

> There are 6,054 students enrolled in a school. The school auditorium has seating for 426 people. The director of the school play wants to have enough showings so that all of the students can attend the play. How many showings must they have to allow each student to attend 1 performance? *6,054 ÷ 426 = 14 r90; 15 showings; elicit that the remainder of 90 represents 90 people that need to attend a performance, so 1 more showing must be added to the quotient 14.*

Student Text pp. 62–63

Lesson 27

Student Text pp. 64–65
Daily Review p. 413g

Objectives
- Use the Order of Operations to simplify an expression
- Complete an expression to make an equation true

Introduce the Lesson

1. Write 36 + 11 + 9.5 = __ for display and direct the students to write it on paper.
➤ **How can you apply the Associative Property of Addition to this equation?** ***Elicit that you can write parentheses around two addends.***
➤ **What do the parentheses tell you?** ***Add the addends inside the parentheses first.***
2. Direct the students to write parentheses around any two addends and solve the equation.
Select a student to tell which two addends he grouped together, tell the sum, and explain how he solved the equation. Choose a student who grouped the other two addends to explain how he solved the equation.
➤ **What is the sum of this equation for either way you group the addends?** ***56.5***
3. Follow a similar procedure for applying the Associative Property of Multiplication to 2 × 7 × 3 = ***42***.

Teach for Understanding

Use the Order of Operations to simplify an expression

1. Write 27 ÷ (3 + 6) for display. Point out that this is a mathematical expression. Remind the students that expressions contain numbers, operation signs, and sometimes variables. Instruct them to solve on paper all the expressions in this lesson as you guide them.
➤ **What mathematical operations are in this expression?** ***division and addition***
➤ **Which operation in the expression should you solve first? Why?** ***Addition; elicit that in a multi-step problem, operations in parentheses are solved first.***
➤ **What is 3 + 6?** ***9***
Write 27 ÷ 9 below 27 ÷ (3 + 6). Point out that when 3 + 6 is simplified as 9, the expression is simplified as 27 ÷ 9.
➤ **What is 27 ÷ 9?** ***3***
Write 3 below 27 ÷ 9.
2. Write 27 ÷ (3 + 6) = 3 beside the solution process. Point out that you took a long expression and simplified it as a single value; the given expression is equal to the value of 3. Continue to display the equation.
3. Explain that when a problem contains more than one operation, there is a specific order or sequence that must be followed to correctly solve the problem. This sequence is called the *Order of Operations*. Point out that the students already know the first step in the Order of Operations: simplify or find the value of expressions in parentheses first.
4. Call attention to the Order of Operations listed on Student Text page 64. As you discuss the process, remind the students that an exponent is a small raised number that tells how many times a number (the base) is repeated as a factor.
5. Direct attention to 27 ÷ (3 + 6) = 3 written for display. Explain that if you had not followed the Order of Operations, the answer would be incorrect: 27 ÷ 3 = 9, 9 + 6 = 15.
6. Write 16 ÷ 2 + 5 for display.
➤ **Are there any expressions in parentheses that need to be simplified?** ***no***
7. Explain that when there are no parentheses in an expression, you begin to simplify the expression with the next operation(s) listed in the Order of Operations.
➤ **Do you need to find the value of any exponents?** ***no***
➤ **Since there are no expressions in parentheses and no exponents, what part of this equation should you solve first?** ***Elicit that 16 ÷ 2 should be solved first because "multiply and divide from left to right" is next in the Order of Operations.***
➤ **What is 16 ÷ 2?** ***8***
Write 8 + 5 below 16 ÷ 2 + 5. Point out that when 16 ÷ 2 is simplified as 8, the expression is simplified as 8 + 5.
➤ **What is 8 + 5?** ***13***
Write 13 below 8 + 5.
8. Write 16 ÷ 2 + 5 = 13 beside the solution process. Remind the students that they simplified a longer expression as a single equivalent value (13).
9. Follow a similar procedure for these expressions. Point out that if a particular operation is not in the expression being solved, you should continue with the next operation(s) listed in the Order of Operations.

$5 \times 3^2 - (4 - 1)$	$24 \div 6 \div 2 + 1$
$5 \times 3^2 - \mathbf{3}$	$\mathbf{4} \div 2 + 1$
$5 \times \mathbf{9} - 3$	$\mathbf{2} + 1$
$\mathbf{45} - 3$	$\mathbf{3}$
$\mathbf{42}$	

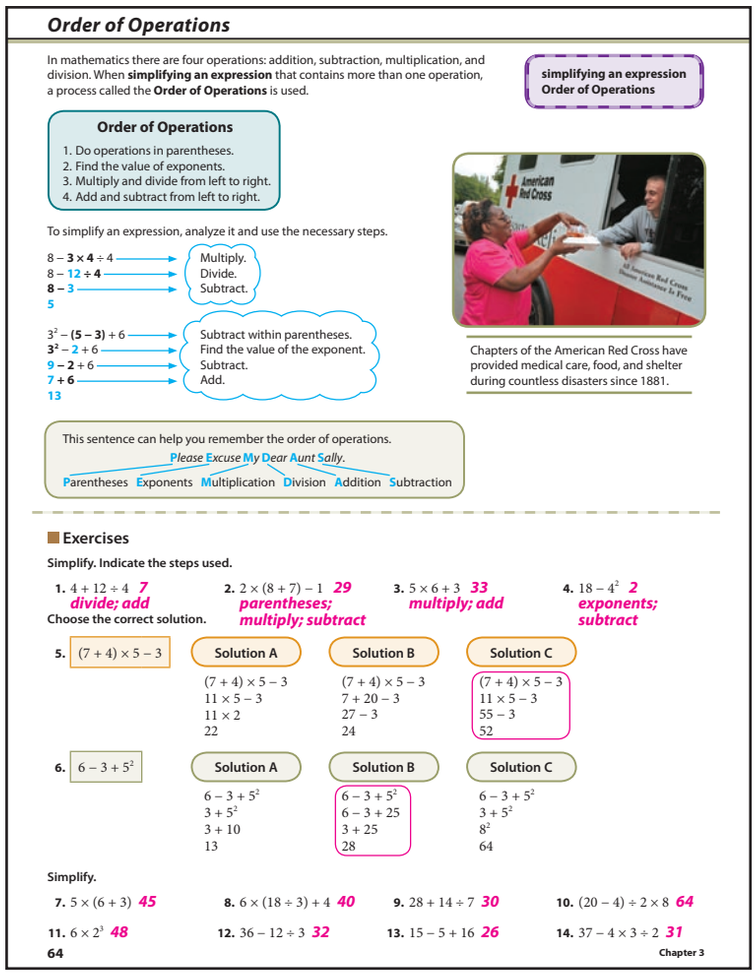
$13.46 + 4 \times 3 \div 6 - 4$
$13.46 + \mathbf{12} \div 6 - 4$
$13.46 + \mathbf{2} - 4$
$\mathbf{15.46} - 4$
$\mathbf{11.46}$

10. Write these expressions for display and guide the students in solving them. Explain that when there is more than one operation in parentheses, you must follow the Order of Operations within the parentheses.

$(54 - 8 \times 6) \div 3 \times 4$	$18 + (7 \times 8 - 6)$
$(54 - \mathbf{48}) \div 3 \times 4$	$18 + (\mathbf{56} - 6)$
$\mathbf{6} \div 3 \times 4$	$18 + \mathbf{50}$
$\mathbf{2} \times 4$	$\mathbf{68}$
$\mathbf{8}$	

11. Repeat the procedure for these expressions. Explain that when there is an exponent outside the parentheses, you must first simplify the expression in the parentheses, continue following the Order of Operations, and then find the value of the exponent.

$(49 - 42)^2 \times 2$	$58 + (6 - 24 \div 8)^3$
$\mathbf{7}^2 \times 2$	$58 + (6 - \mathbf{3})^3$
$\mathbf{49} \times 2$	$58 + \mathbf{3}^3$
$\mathbf{98}$	$58 + \mathbf{27}$
	$\mathbf{85}$



Order of Operations

In mathematics there are four operations: addition, subtraction, multiplication, and division. When **simplifying an expression** that contains more than one operation, a process called the **Order of Operations** is used.

simplifying an expression
Order of Operations

Order of Operations
1. Do operations in parentheses.
2. Find the value of exponents.
3. Multiply and divide from left to right.
4. Add and subtract from left to right.

To simplify an expression, analyze it and use the necessary steps.

$8 - \mathbf{3 \times 4} \div 4$ → Multiply.
$8 - 12 \div \mathbf{4}$ → Divide.
$\mathbf{8 - 3}$ → Subtract.
5

$3^2 - \mathbf{(5 - 3)} + 6$ → Subtract within parentheses.
$\mathbf{3^2} - 2 + 6$ → Find the value of the exponent.
$9 - \mathbf{2} + 6$ → Subtract.
$\mathbf{7 + 6}$ → Add.
13

Chapters of the American Red Cross have provided medical care, food, and shelter during countless disasters since 1881.

This sentence can help you remember the order of operations.
*P*lease *E*xcuse *M*y *D*ear *A*unt *S*ally.
Parentheses Exponents Multiplication Division Addition Subtraction

Exercises

Simplify. Indicate the steps used.

1. $4 + 12 \div 4$ *7 divide; add*
2. $2 \times (8 + 7) - 1$ *29 parentheses; multiply; subtract*
3. $5 \times 6 + 3$ *33 multiply; add*
4. $18 - 4^2$ *2 exponents; subtract*

Choose the correct solution.

5. $(7 + 4) \times 5 - 3$

Solution A	Solution B	Solution C
$(7 + 4) \times 5 - 3$	$(7 + 4) \times 5 - 3$	$(7 + 4) \times 5 - 3$
$11 \times 5 - 3$	$7 + 20 - 3$	$11 \times 5 - 3$
11×2	$27 - 3$	$55 - 3$
22	24	52

6. $6 - 3 + 5^2$

Solution A	Solution B	Solution C
$6 - 3 + 5^2$	$6 - 3 + 5^2$	$6 - 3 + 5^2$
$3 + 5^2$	$6 - 3 + 25$	$3 + 5^2$
$3 + 10$	$3 + 25$	8^2
13	28	64

Simplify.

7. $5 \times (6 + 3)$ *45*
8. $6 \times (18 \div 3) + 4$ *40*
9. $28 + 14 \div 7$ *30*
10. $(20 - 4) \div 2 \times 8$ *64*
11. 6×2^3 *48*
12. $36 - 12 \div 3$ *32*
13. $15 - 5 + 16$ *26*
14. $37 - 4 \times 3 \div 2$ *31*

When more than one operation is in parentheses, follow the order of operations within the parentheses.

$(3 + \mathbf{7 \times 2}) - 6$ → Multiply.
$(\mathbf{3 + 14}) - 6$ → Add.
$\mathbf{17 - 6}$ → Subtract.
11

When an exponent is outside parentheses, solve the operation in parentheses first and then find the value of the exponent.

$3 \times \mathbf{(5 - 3)^3} \div 4$ → Subtract within parentheses.
$3 \times \mathbf{2^3} \div 4$ → Find the value of the exponent.
$\mathbf{3 \times 8} \div 4$ → Multiply.
$\mathbf{24 \div 4}$ → Divide.
6

Exercises

Simplify.

15. $48 \div (2 + 2 \times 2)$ *8*
16. $(25 - 15)^3 \times 8$ *8,000*
17. $4 - 3 + 8 + 3^2$ *18*
18. $5 + 12 \div (2 + 4 - 2)$ *8*
19. $(7 - 4)^2 \times 7$ *63*
20. $2{,}500 \div 10^2$ *25*
21. $(75 - 70)^2$ *25*
22. $7 + 10 - (18 + 12) \div 5$ *11*

Insert parentheses to make the equation true.

23. $5 - 3 - 1 = 3$ *(3 − 1)*
24. $10 - 24 \div 6 + 2 = 7$ *(6 + 2)*
25. $8 \times 8 + 2 + 5 = 85$ *(8 + 2)*
26. $17 - 4 \times 2 = 9$ *(4 × 2)*

Practice & Application

27. Estimate the quotient for $324.08 \div 8$. Explain your estimate. *Estimates may vary.*

28. Write three numbers that are divisible by 2, 4, 8, and 10. *Answers will vary but will be multiples of 40.*

29. If there are 725 cots in rows of 25 at the shelter, how many rows of cots are there? *29 rows*

30. Write the value of $4 \cdot 8 + 8 \cdot 7$. *88*

31. If 3,874 is divided into 100 groups, how many are in each group? *38.74*

32. What is the value of $(4 \times 10^4) + (6 \times 10^3) + (8 \times 10^2) + (1 \times 10^1) + (3 \times 10^0)$? *46,813*

33. What is the value of $(n + m) \times p^2$, if $n = 3$, $m = 7$, and $p = 7$? *490*

34. Write a three-step expression that is equal to the value of 75. *Answers will vary; possible answer: 25 + 10 × 15 ÷ 3.*

35. Write a four-step expression that equals 100. Use one exponent. *Answers will vary; possible answer: 22 ÷ 2 × 3² + 1.*

The American Red Cross encourages people to plan for disasters by having an emergency kit and emergency plan.

Complete DAILY REVIEW 9 on page 413.

12. Write the following variable values and the two expressions for display. Elicit that in order to solve these problems, you must substitute the given values for the variables. Guide the students in solving the problems.

$s = 4$	$u = 9$	$a = 22$
$a - u + s^2$		$(s \times u) \times 2 - a$
$\mathbf{22 - 9 + 4^2}$		$\mathbf{(4 \times 9) \times 2 - 22}$
$22 - 9 + \mathbf{16}$		$\mathbf{36} \times 2 - 22$
$\mathbf{13} + 16$		$\mathbf{72} - 22$
$\mathbf{29}$		$\mathbf{50}$

Complete an expression to make an equation true

Write these equations for display. Guide the students in using the guess-and-check strategy to insert parentheses in each expression to make the equation true. Remind the students that the values on both sides of the equal sign must be equal.

$56 \div (8 - 1) = 8$ $\qquad$ $9 + (4 \times 15) \div 6 = 19$
$5 \times (4 + 10.25) = 71.25$

Student Text pp. 64–65

(*Note*: *Assessment* available on Teacher's Toolkit CD.)

Lesson 28

Student Text pp. 66–67
Daily Review p. 413h

Objectives
- Solve multi-step problems
- Use the Order of Operations to write an equation for a multi-step problem

Teacher Materials
- Multi-Step Problems, page IA17 (CD)

Student Materials
- Multi-Step Problems, page IA17 (CD)

Note
Since more than one equation can often be used to correctly solve a multi-step word problem, and since the order in which the operations are written within an equation may vary, the equations given in this lesson represent possible solutions.

Teach for Understanding

Solve multi-step problems

1. Display and distribute the Multi-Step Problems page. Use the Problem-Solving Plan as you guide the students in solving the problems. Draw attention to the first problem. Guide the students in determining that all the information given is necessary for solving the problem. Point out that there are often one or more equations that can be written to solve a problem.
2. Instruct the students to solve the problem on paper and to write the equations that show their solution. Choose students to share their equations. ***Solution 1: 36 + 60 = 96 pieces of money, and 96 ÷ 12 = 8 pieces of money per grandchild. Solution 2: 36 ÷ 12 = 3 coins per grandchild; 60 ÷ 12 = 5 bills per grandchild; 3 coins + 5 bills = 8 pieces of money per grandchild.***
   ➤ **How many steps are needed to find the solution?** ***2 or 3 steps, depending on the way it is solved.***
3. Direct attention to the Order of Operations listed at the top of the transparency. Explain that the Order of Operations can be used to write one equation to show the solution for a multi-step problem.
   ➤ **For solution 1, what step was done first?** ***36 and 60 were added together.***
4. Write 36 + 60 for display.
   ➤ **What step is next?** ***96, the sum of 36 and 60, is divided by 12.***
   Write ÷ 12 after 36 + 60.
5. Choose a student to solve the equation as written, following the Order of Operations. ***36 + 60 ÷ 12 = 41***
   ➤ **Why do you think this equation gives a different answer from solution 1?** ***Elicit that in solution 1, the number of coins and bills were added together first; in this new equation, the addition wasn't simplified first.***
   ➤ **How can you simplify the addition first in this equation and still follow the correct Order of Operations?** ***Elicit that by placing parentheses around the addition expression you will solve it first, and then divide the sum by 12.***
6. Choose a student to write parentheses around the addition expression and solve the entire problem using the Order of Operations. ***(36 + 60) ÷ 12 = 8***
   ➤ **For solution 2, what step was done first?** ***36 was divided by 12.***
7. Write 36 ÷ 12 for display.
   ➤ **What step is next?** ***60 is divided by 12.***
   Write 60 ÷ 12 after 36 ÷ 12, leaving a small space between the expressions.
   ➤ **What is the third and final step for solution 2?** ***The two quotients are added together.***
   Insert a plus sign between the two division expressions. Choose a student to solve the expression according to the Order of Operations. ***36 ÷ 12 + 60 ÷ 12 = 8***
   Point out that it isn't necessary to add parentheses to the equation for solution 2 because the three steps already follow the Order of Operations.
8. Direct attention to the second problem. Guide the students in seeing that all the information in the problem is necessary. Elicit from them that Monday through Friday indicates 5 days in the week. On each of those 5 days, Dr. Adams sees 10 patients in the mornings and 8 patients in the afternoons.
9. Follow a procedure similar to the one used in the previous problem to guide the students in writing multi-step equations that show solutions to the problem. Point out that in one of the solutions, parentheses must be inserted to follow the Order of Operations. ***Solution 1: 10 + 8 = 18 patients in the mornings and afternoons each day; 5 × 18 = 90 patients in the mornings and afternoons Monday through Friday; 90 + 3 + 3 = 96 total patients seen Monday through Friday; 5 × (10 + 8) + 3 + 3 = 96 total patients seen Monday through Friday. Solution 2: 5 × 10 = 50 patients seen in the mornings Monday through Friday; 5 × 8 = 40 patients seen in the afternoons Monday through Friday; 50 + 40 + 3 + 3 = 96 total patients seen Monday through Friday; 5 × 10 + 5 × 8 + 3 + 3 = 96 total patients seen Monday through Friday.***
10. Direct attention to the third problem. Follow a similar procedure to guide the students in writing multi-step equations that show solutions to the problem. ***Solution 1: 3 × 8 = 24 red pens in packages; 24 + 37 = 61 red pens; 61 + 87 = 148 pens; 3 × 8 + 37 + 87 = 148 pens. Solution 2: 37 + 87 = 124 loose pens; 3 × 8 = 24 red pens in packages; 124 + 24 = 148 pens; 37 + 87 + 3 × 8 = 148 pens.***

Multi-Step Problems

The **Order of Operations** demands that the parts of an equation be solved in a specific order; however, often a multi-step problem can have more than one correct equation. The Order of Operations can help you write a correct equation.

Order of Operations

1. Do operations in parentheses.
2. Find the value of **exponents**.
3. Multiply and divide from left to right.
4. Add and subtract from left to right.

A church receives a donation of 100 blankets from a local store. There are 125 blankets in storage that were donated by the church congregation. The church will distribute the blankets evenly among 25 local shelters. How many blankets will each shelter receive?

(100 + 125) ÷ 25 = 225 ÷ 25 = 9 blankets
Seth added before dividing, so the addition must be in parentheses.

100 ÷ 25 + 125 ÷ 25 = 4 + 5 = 9 blankets
Gianna divided before adding, so no parentheses were needed.

Seth's and Gianna's equations show different ways to solve the same problem. The Order of Operations allowed them both to write a correct equation.

Exercises

Choose two possible equations. Solve.

1. Aiden will give the 16 disaster victims 3 bottles of water each. There are 12 bottles of water in a package. How many packages will he need?

$16 \times 3 \div 12 = \_\_$

$12 \div 3 + 16 = \_\_$

$(16 \times 3) \div 12 = \_\_$

4 packages

2. Savannah collected 37 boys' coats, 58 girls' coats, and some infant coats for needy families at several shelters. If there were 154 coats collected, how many of the coats were infant coats?

$154 - (37 + 58) = \_\_$

$58 - 37 + 154 = \_\_$

$154 - 37 - 58 = \_\_$

59 infant coats

3. Anna earns $8.00 per hour for baby-sitting. She earns $5.00 per hour for pet-sitting. If she baby-sat for 4 hours last week and cat-sat for 8 hours, how much did she earn? ***$72.00***

$(4 \times \$8.00) + (8 \times \$5.00) = \_\_$

$8 \times \$5.00 + 4 \times \$8.00 = \_\_$

$12 \times \$8.00 + \$5.00 = \_\_$

Solve. Write one equation for the word problem.

4. The coastal resort saves $100 per month for new safety and rescue equipment. They have $600 saved so far. How many more months will they need to save for a four-person raft priced at $1,364.00?
($1,364 – $600) ÷ $100 = 7.64 months ≈ 8 months; equations may vary but must show the order of operations.

Clean drinking water was needed in Haiti after the 2010 earthquake.

Simplify.

5. $5 + 3 \times (6 + 4)$ ***35***

6. $8 \times 2^2 + 6$ ***38***

7. $5 + 4 \times 6$ ***29***

8. $24 - 8 \div 4 \times 2$ ***20***

9. $8 + 8 + 2 \times 4^2$ ***48***

10. $(30 - 6) \div 8 + 5^2$ ***28***

11. $10 + 3 \times 8 - 1$ ***33***

12. $12 - 4 \div 2 + 5$ ***15***

13. $(9 \times 6) - 2^2 + 6$ ***56***

Solve. Write one equation for the word problem.

14. A school lunch ticket costs $3.75. How much does it cost to eat lunch Monday through Friday?
$3.75 × 5 = $18.75

15. Miss Robbins needs a border for a bulletin board that has a length of 90 centimeters and a width of 75 centimeters. How many centimeters of border does she need? ***(2 × 90) + (2 × 75) = 330 cm***

16. Carlos bought three 8-ounce packages of cheese for a total of $5.25 including tax. He gave the cashier a ten-dollar bill. How much change did he receive? ***$10.00 – $5.25 = $4.75***

17. Mike's library had 87 books. He received two new Bible commentary sets with 12 books each. How many books does he now have?
87 + (2 × 12) = 111 books

18. Lily's math test scores are 100, 88, 92, and 84. What is her average test score?
(100 + 88 + 92 + 84) = 364; 364 ÷ 4 = 91

19. The restaurant has 16 tables. Each table seats 12 people. Are there enough seats for the 207 people attending a brunch? ***no; 16 × 12 = 192***

Practice & Application

20. Write a nine-digit number that is *less than* 300,000,000.
Answers will vary.

21. One dozen eggs cost $1.68. How much is each egg?
$1.68 ÷ 12 = $0.14

22. Complete the pattern: ___, ___, 18, 24, 30, 36. ***6; 12***

23. 4.78 + 27.6 + 18 ***50.38***

24. Write the product of 14 and 20. ***280***

25. 0.7 ÷ 5 ***0.14***

26. Write the three equations related to 1,800 ÷ 200 = 9.
1,800 ÷ 9 = 200; 200 × 9 = 1,800; 9 × 200 = 1,800

Choose two operations (+, –, ×, ÷) and the three given numbers to write an expression equal to 24. ***Answers may vary.***

27. 12 4 2
12 ÷ 2 × 4

28. 2 18 12
2 × 18 – 12

29. 7 5 2
(7 + 5) × 2

30. 2 17 10
2 × 17 – 10

Complete DAILY REVIEW h on page 413.

Student Text pp. 66–67

Lesson 29 **Student Text** pp. 68–69

Chapter Review

Objectives

- Demonstrate an understanding of division and the terms *dividend*, *divisor*, and *quotient*
- Demonstrate an understanding of the inverse relationship between multiplication and division
- Divide multiples of 10 using mental math
- Divide by a power of 10
- Recognize numbers divisible by 2, 3, 4, 5, 6, 9, or 10
- Divide a whole number by a 1-, 2-, or 3-digit divisor
- Divide a decimal by a 1-, 2-, or 3-digit whole number
- Solve a division word problem
- Estimate a quotient
- Interpret a remainder
- Divide to find a quotient less than 1
- Express a fraction as an equivalent decimal
- Use the Order of Operations to simplify an expression

Note

This lesson reviews the concepts presented in Chapter 3 to prepare the students for the Chapter 3 Test. Student Text pages 68–69 provide the students with an excellent study guide.

Check for Understanding

Demonstrate an understanding of division

1. Write these problems for display. Choose students to identify the dividend, the divisor, and the quotient in each problem.

   $81 \div 9 =$ ***9*** $\quad 2\overline{)26}$ ***13*** $\quad \frac{18}{6} =$ ***3***

2. Remind the students that division problems are solved to find either the number of sets or the number in each set.
3. Instruct the students to draw on paper a part-whole model for $\frac{18}{6} = 3$, showing the divisor (6) as the number in each set and the quotient (3) as the number in each set. Refer to Lesson 21 if needed.
4. Direct the students to draw a part-whole model for $\frac{18}{6} = 3$, showing the divisor (6) as the number in each set and the quotient (3) as the number of sets.

Demonstrate an understanding of the inverse relationship between multiplication and division

Write these missing factor equations for display. Follow a procedure similar to the one used in Lesson 21 to guide the students in finding the value of n in each equation.

$n \times 12 = 72$ $\quad 4 \times n = 868$ $\quad n \times 4 = 36$

n = ***6*** $\quad$ n = ***217*** $\quad$ n = ***9***

Recognize numbers divisible by 2, 3, 4, 5, 6, 9, or 10

Review the divisibility rules on page 502 of the Student Text Handbook. Write these numbers for display. Choose students to tell what numbers each displayed number is divisible by and to explain their answers.

270 ***3, 5, 9, 10*** $\quad$ 66 ***2, 3, 6*** $\quad$ 9,360 ***2, 3, 4, 6, 9, 10***

Divide multiples of 10

Write these problems for display. Choose students to solve the problems mentally and explain how they found the quotient. Refer to Lesson 22 if needed.

$30\overline{)180}$ ***6*** $\quad 20\overline{)8{,}000}$ ***400*** $\quad 80\overline{)64{,}000}$ ***800***

$400 \div 40 =$ ***10*** $\quad 1{,}200 \div 60 =$ ***20*** $\quad 12{,}000 \div 40 =$ ***300***

Divide by a power of 10

Write these equations for display. Use a procedure similar to the one used in Lesson 26 to guide the students in solving the equations mentally.

$83.64 \div 10 =$ ***8.364*** $\quad 46.4 \div 1{,}000 =$ ***0.0464***

$7{,}400 \div 100 =$ ***74*** $\quad 0.4 \div 10 =$ ***0.04***

$2.6 \div 100 =$ ***0.026*** $\quad 32{,}581 \div 1{,}000 =$ ***32.581***

Divide whole numbers and decimals

1. For the following word problems, discuss each word problem as noted below it and guide the students in finding an estimate. Then direct the students to solve the problem on paper, using long division. Choose a student to write his solution for display and explain it. Guide the explanation as needed.

   The Colorado Pedal Club rode 43 miles. The bikers completed the trip in 6 hours. To the nearest tenth of a mile, how many miles did they average per hour? ***7–8 miles per hour; 43 ÷ 6 ≈ 7.16; 7.2 miles per hour***

2. Point out that distances are often measured to the nearest tenth of a mile. Elicit that you must annex zeros to divide to the Hundredths place and then round the quotient to the nearest tenth.

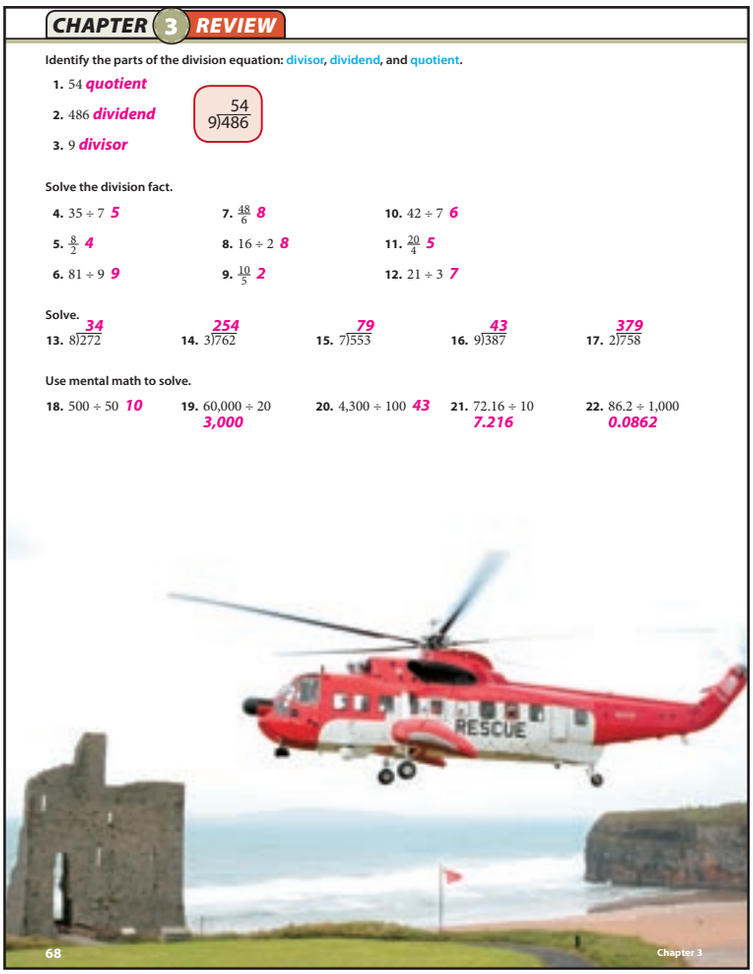
   A circular parachute can be made using 52 yards of nylon material. If 368 yards of nylon material are available, how many parachutes can be made? ***7–8 parachutes; 368 ÷ 52 = 7 r4; 7 parachutes***

3. Elicit that since the question asks for the number of parachutes that can be made from a specific amount of nylon, you do not need to annex zeros to divide decimal places. The remainder represents 4 yards of nylon which is not enough to make another parachute, so the remainder can be omitted from the final answer. Elicit that the remaining 4 yards of nylon represents a part of the yardage needed to make another parachute.

   There will be 856 people attending the missions banquet. Each table seats 16 people. How many tables are needed for everyone who will attend the banquet? ***40–50 tables; 856 ÷ 16 = 53 r8; 54 tables***

4. Elicit that the remainder of 8 represents 8 people that will need a place to sit, so you do not need to annex zeros to divide decimal places. To provide enough tables for all the attendees, 1 more table must be added to the quotient 53.

   The Kellors will be traveling 3,876 miles during their trip. Their van averages 27 miles per gallon. How many gallons of gas will they need to complete the trip? ***100–200 gallons; 3,876 ÷ 27 ≈ 143.5; 144 gallons***



CHAPTER 3 REVIEW

Identify the parts of the division equation: divisor, dividend, and quotient.

1. 54 *quotient*
2. 486 *dividend*
3. 9 *divisor*

$$9\overline{)486}\quad 54$$

Solve the division fact.

4. $35 \div 7$ *5*
5. $\frac{8}{2}$ *4*
6. $81 \div 9$ *9*
7. $\frac{48}{6}$ *8*
8. $16 \div 2$ *8*
9. $\frac{10}{5}$ *2*
10. $42 \div 7$ *6*
11. $\frac{20}{4}$ *5*
12. $21 \div 3$ *7*

Solve.

13. $8\overline{)272}$ *34*
14. $3\overline{)762}$ *254*
15. $7\overline{)553}$ *79*
16. $9\overline{)387}$ *43*
17. $2\overline{)758}$ *379*

Use mental math to solve.

18. $500 \div 50$ *10*
19. $60{,}000 \div 20$ *3,000*
20. $4{,}300 \div 100$ *43*
21. $72.16 \div 10$ *7.216*
22. $86.2 \div 1{,}000$ *0.0862*

Write the estimate range.

23. $21\overline{)189}$ *9–10*
24. $48\overline{)1{,}152}$ *20–30*
25. $73\overline{)2{,}263}$ *30–40*
26. $29\overline{)1{,}856}$ *60–70*
27. $62\overline{)930}$ *10–20*

Solve.

28. $8\overline{)0.96}$ *0.12*
29. $3\overline{)1.746}$ *0.582*
30. $8\overline{)45.12}$ *5.64*

Find the equivalent decimal for the fraction.

31. $\frac{1}{4}$ *0.25*
32. $\frac{1}{5}$ *0.2*

Solve.

33. An aluminum canoe can hold up to 3 people plus equipment. How many canoes are needed for 125 campers? *125 ÷ 3 = 41 r2; 42 canoes*
34. The trip to the skydiving drop zone costs $170. If 4 people share the cost of the trip, how much will each person pay? *$170.00 ÷ 4 = $42.50*
35. The school sold 181 tickets for Friday night's program and 215 tickets for Saturday night's program. How many more tickets were sold for Saturday than Friday? *215 – 181 = 34 tickets*
36. Samantha bought 15 yards of fabric to make curtains for 3 windows. If she uses the same amount of fabric for each window curtain, how much fabric does she have for each? *15 yd ÷ 3 = 5 yd*
37. Mr. Faber hired Gabe to mow his lawn and trim the hedges. He paid Gabe $50. If it took Gabe 3 hours to complete the job, how much did he earn per hour? Round the amount to the nearest hundredth. *$50.00 ÷ 3 = $16.666 ≈ $16.67*
38. In one week, Henry worked 40 hours and earned $482.00. How much did he earn each hour? *$482.00 ÷ 40 = $12.05*
39. If Henry earns the same amount each week, how much will he earn in 5 weeks? *$482.00 × 5 = $2,410.00*
40. Henry earned $25,064.00 one year and $26,520.00 the next year. How much did he earn for the two years combined? *$25,064.00 + $26,520.00 = $51,584.00*

Follow the Order of Operations to find the answer.

41. $3 + 8 \times 7$ *59*
42. $(6 \times 9) \div 3$ *18*
43. $18 - 15 \div 3$ *13*
44. $24 \div 4 \times 2$ *12*
45. $(8 + 12) \times 5$ *100*

Solve.

46. $53\overline{)1{,}771}$ *33 r22*
47. $574\overline{)13{,}202}$ *23*
48. $175\overline{)4{,}375}$ *25*

Solve. Annex zeros as needed to find a decimal quotient.

49. $4\overline{)175.00}$ *43.75*
50. $75\overline{)864.00}$ *11.52*
51. $80\overline{)9{,}612.00}$ *120.15*

5. Elicit that to determine the number of whole gallons of gasoline the Kellors will need, annex a zero to divide to the Tenths place and round the quotient to the nearest gallon.

Grandma bought a camera for each of her 3 grandchildren. The total cost of the cameras was $185.62. To the nearest cent, what was the average cost of the cameras? *$60.00–$70.00; $185.62 ÷ 3 ≈ $61.873; $61.87* [BAT: 5b Giving]

6. Elicit that you must annex a zero to divide to the One Thousandths place and round the quotient to the nearest hundredth to find the average cost of the cameras to the nearest cent.

Divide to find a quotient less than 1

Guide the students in using long division to solve these problems on paper. For the word problem, choose a student to write for display the equation and the final answer.

$\frac{1}{2} = 0.5$ $\frac{3}{4} = 0.75$ $\frac{2}{5} = 0.4$

The primary children's class gave $27.86 for the church parking lot project. There are 40 children in the class. What was the average amount given by each child? *$27.86 ÷ 40 = $0.696; $0.70* [BAT: 5b Giving]

Use the Order of Operations to simplify an expression

Use a procedure similar to the one used in Lesson 27 to guide the students in simplifying these expressions.

$7 + 3 \times 4^2 \div 8$
$7 + 3 \times 16 \div 8$
$7 + 48 \div 8$
$7 + 6$
13

$8 \times 2 + 32 + (90 \div 9)$
$8 \times 2 + 32 + 10$
$16 + 32 + 10$
$48 + 10$
58

$(5 \times 4 + 8) \div 14$
$(20 + 8) \div 14$
$28 \div 14$
2

$(7 \times 4) + 1 + 2 \times 5 + 1 - 55 \div 5$
$28 + 1 + 2 \times 5 + 1 - 55 \div 5$
$28 + 1 + 10 + 1 - 55 \div 5$
$28 + 1 + 10 + 1 - 11$
$29 + 10 + 1 - 11$
$39 + 1 - 11$
$40 - 11$
29

Student Text pp. 68–69

Lesson 30 — **Student Text** pp. 70–73

Chapter 3 Test
Cumulative Review

For a list of the skills reviewed in the Cumulative Review, see the Lesson Objectives for Lesson 30 in the Chapter 3 Overview on page 51 of this Teacher's Edition.

Student Materials

- Cumulative Review Answer Sheet, page IA9 (CD)

Use the Cumulative Review on Student Text pages 70–72 to review previously taught concepts and to determine which students would benefit from your reteaching of the concepts. To prepare the students for the format of achievement tests, instruct them to work on a separate sheet of paper, if necessary, and to mark the answers on the Cumulative Review Answer Sheet.

Read aloud the Career Link on Student Text page 73 (page 71 of this Teacher's Edition) and discuss the value of math as it relates to a highway patrol officer.

CUMULATIVE REVIEW

Test Prep

Mark the answer.

1. 7,000 × 6 = ___
- A. 42,000
- B. 46,000
- C. 48,000
- D. none of the above

2. 11 × 4 × 15 = ___
- A. 460
- B. 660
- C. 860
- D. none of the above

3. 6 × 6 × 6 × 6 = ___
- A. 6^6
- B. 6^5
- C. 6^4
- D. none of the above

4. The greatest common factor of 15 and 36 is ___.
- A. 2
- B. 3
- C. 64
- D. 5

5. The least common multiple of 18 and 45 is ___.
- A. 90
- B. 3
- C. 870
- D. 9

Mark the matching expression.

6. 7^3 = ___
- A. 3 × 3 × 3 × 3 × 3 × 3 × 3
- B. 7 × 3
- C. 7 × 7 × 7

7. 
- A. 10^4
- B. 10 × 4
- C. 5 × 3 × 4

8. 
- A. 3 × 3 = 9
- B. 5 × 3 = 15
- C. 3 × 5 = 15

9. 
- A. 40 ÷ 4
- B. 10^4
- C. 40 ÷ 5

10.

40			
10	10	10	10

- A. 40 ÷ 4
- B. 40 × 4
- C. 10 × 40

Mark the answer.

11. The value of 3 in 92.473 is ___.
- A. 0.00003
- B. $\frac{3}{100,000}$
- C. 3 thousandths
- D. none of the above

12. sixty-two and seven thousand, one hundred forty-five ten thousandths
- A. 6.2718
- B. 627.145
- C. 62.7145
- D. none of the above

13. 423,294 ○ 423,294
- A. >
- B. <
- C. =

14. 81,474 ○ 81,431
- A. >
- B. <
- C. =

15. Which numbers are listed from *least* to *greatest*?
- A. 9.8457 8,241 78,463 19,436
- B. 19,436 78,463 8,241 9.8457
- C. 9.8457 8,241 19,436 78,463

16. $\frac{2}{5}$ = ___
- A. 0.40
- B. 0.25
- C. 1.25

17. $97.36 ÷ 4 = ___
- A. $2.07
- B. $21.17
- C. $24.34

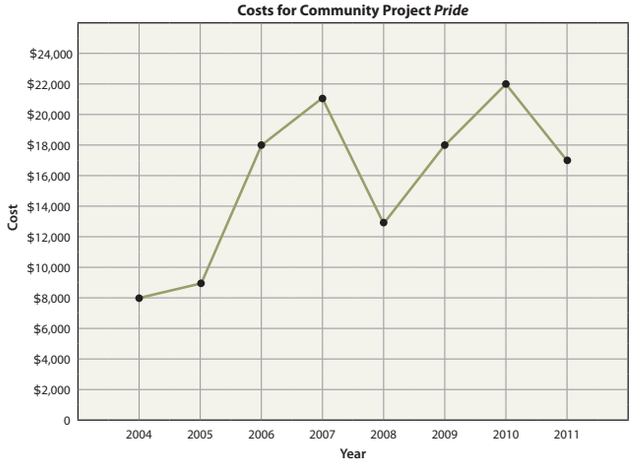
18. 64 ÷ (6 + 2) + 3 = ___
- A. 6
- B. 8
- C. 11

Josh has 375 toy soldiers.

19. If Josh puts the toy soldiers into 25 platoons, how many soldiers will be in each platoon?
- A. 6
- B. 15
- C. 75

20. If Josh puts the toy soldiers into squads of 5, how many squads will be made?
- A. 79
- B. 75
- C. 750

Use the data from the line graph to find the answer.



21. How many years of project costs are recorded?
- A. 8
- B. 11
- C. 7

22. What was the project cost for 2008?
- A. $11,000
- B. $14,000
- C. $13,000

23. What is the range of the costs of the projects?
- A. $12,000
- B. $14,000
- C. $30,000

24. Choose the statement that is true about the project costs from 2008–2011.
- A. a two-year increase and a two-year decrease
- B. a three-year decrease
- C. a two-year increase and a one-year decrease

25. What is the average project cost for 2006 and 2007?
- A. $19,200
- B. $18,200
- C. $19,500

CAREER LINK

Highway Patrol Officer

Highway patrol officers use math in many ways while on patrol and while investigating accidents. An officer must know specific formulas and equations and use problem-solving skills to determine how an accident occurred and who is responsible for the accident. To determine the cause of an accident, he must understand speed, distance, and friction as he looks at skid marks and know the sizes and types of the vehicles involved and the road surface.

An officer also uses decimals and the metric system to determine blood alcohol levels of drunk drivers. Numbers as small as milliliters are important when using a breathalyzer to measure alcohol content.

Highway patrol officers are concerned about drivers using excessive speed. They know how speed can cause accidents and delays on the roads they patrol. Math is vital in determining excessive speeds and the fines associated with those speeds. Officers care for the safety of drivers and passengers and for the ease of traffic flow.

Additionally, an officer is concerned about the welfare of the people using the road. He often finds himself in dangerous situations as he writes speeding tickets or investigates an accident scene during heavy traffic. When you see a highway patrol officer, show your appreciation for his care and concern as he serves the community.