Name .

Estimate Quotients Using Multiples

Find two numbers the quotient of 142 \div 5 is between. Then estimate the quotient.

You can use multiples to estimate. A **multiple** of a number is the product of a number and a counting number.

Step 1 Think: What number multiplied by 5 is about 142? Since 142 is greater than 10×5 , or 50, use counting numbers 10, 20, 30, and so on to find multiples of 5.

Step 2 Multiply 5 by multiples of 10 and make a table.

Counting Number	10	20	30	40
Multiple of 5	50	100	150	200

Step 3 Use the table to find multiples of 5 closest to 142.

 $20 \times 5 = \underline{100}$ $30 \times 5 = \underline{150}$ $142 \text{ is between } \underline{100} \text{ and } \underline{150}.$ $142 \text{ is closer to } \underline{150}, \text{ so } 142 \div 5 \text{ is about } \underline{30}.$

Find two numbers the quotient is between. Then estimate the quotient.

1.	136 ÷ 6	2.	95 ÷ 3
	between and		between and
	about	i	about
3.	124 ÷ 9	4.	238 ÷ 7
	between and		between and
	about	i	about

4-5

Estimating Quotients

Match each quotient with its best estimate. Then write the letter of the estimate on the appropriate blank to answer the question below.

1.	342 ÷ 8	about 50	E
2.	93 ÷ 7	about 15	Μ
3.	125 ÷ 6	about 12	I
4.	74 ÷ 5	about 20	т
5.	275 ÷ 4	about 70	E
6.	35 ÷ 3	about 40	A
7.	481 ÷ 9	about 18	т
8.	127 ÷ 7	about 13	S

What did you do to find the missing word?

 5
 2
 8
 6
 4
 1
 3
 7

Remainders



Use counters to find the quotient and remainder.

1. 6)19 **2.** 3)14

Divide. Draw a quick picture to help.

3. 39 ÷ 4 **4.** 29 ÷ 3

Lesson 4.2 Enrich

Riddle Time

Use the clues to solve the riddles below. You will need to know the name for each part of a division equation. Use the division problem at the right as a reminder.

1. My divisor is 5. I am greater than 4×5 . I am less than 5×5 . My remainder is 1. What dividend am I? QUOTIENT REMAINDER 9 r1 4)37 DIVISOR DIVIDEND

2. My divisor is 9. I am greater than 7×9 . I am less than 8×9 . My remainder is 7. What dividend am I?

- **3.** My divisor is 8.
 I am less than 30.
 I am greater than 3 × 8.
 My remainder is 5.
 What dividend am I?
- 5. My dividend is 50. My remainder is 1. I am an odd number. What divisor am I?
- 7. My remainder is 8. My dividend is 80. I am a 1-digit number. What divisor am I?

- 4. My divisor is 6.
 I am less than 60.
 I am greater than 8 × 6.
 I have no remainder.
 What dividend am I?
- 6. My dividend is 8 times as large as my divisor.I am an even number less than 15. What quotient am I?
- 8. My dividend is 24.I am 2 more than my quotient.I have no remainder.What divisor am I?

9. Write Math Use Exercises 1–8 as models to write your own division number riddle.

Interpret the Remainder

When you solve a division problem with a remainder, the way you interpret the remainder depends on the situation and the question.

Way 1: Write the remainder as a fraction. Callie has a board that is 60 inches long. She wants to cut 8 shelves of equal length from the board and use the entire board. How long will each shelf be?	Way 2: Use only the quotient. Callie has 60 beads. She wants to make 8 identical bracelets and use as many beads as possible on each bracelet. How many beads will be on each bracelet?	
Divide. 60 ÷ 8 <u>7 r4</u>	Divide. 60 ÷ 8 <u>7 r4</u>	
The remainder, 4 inches, can be divided into 8 equal parts. $\frac{4}{8}$ - remainder $\frac{4}{8}$ - divisor	The remainder is the number of beads left over. Those beads will not be used. Drop the remainder.	
Write the remainder as a fraction.		
Each shelf will be $\frac{7\frac{4}{8}}{1000}$ inches long.	Callie will use <u>7</u> beads on each bracelet.	
Way 3: Add 1 to the quotient. Callie has 60 beads. She wants to put	Way 4: Use only the remainder. Callie has 60 stickers. She wants to give	
8 beads in each container. How many containers will she need? Divide. $60 \div 8$ <u>7 r4</u>	an equal number of stickers to 8 friends. She will give the leftover stickers to her sister. How many stickers will Callie give to her sister?	
8 beads in each container. How many containers will she need? Divide. $60 \div 8$ <u>7 r4</u> The answer shows that Callie can fill 7 containers but will have 4 beads left over. She will need 1 more container for the 4 leftover beads. Add 1 to the quotient. Callie will need <u>8</u> containers.	an equal number of stickers to 8 friends. She will give the leftover stickers to her sister. How many stickers will Callie give to her sister? Divide. $60 \div 8$ <u>7 r4</u> The remainder is the number of stickers left over. Use the remainder as the answer. Callie will give her sister <u>4</u> stickers.	

 There are 35 students going to the zoo. Each van can hold 6 students. How many vans are needed?
 Sue has 55 inches of ribbon. She wants to cut the ribbon into 6 equal pieces. How long will each piece be?

Remainder Questions

Read each scenario. Use the scenario to write questions that would have the given answers.

 There are 52 students in the fourth grade. Each minivan can hold 6 students. The students are going on a field trip.

8.	
-	
9.	
-	
4.	

2. Six friends are going on a hike. Becky made 64 ounces of trail mix.

	10	<u>6</u>
	4	
3.	ca	Write Math Why is it important to read division problems arefully before giving the answer?

Divide Tens, Hundreds, and Thousands

You can use base-ten blocks, place value, and basic facts to divide.

Divide. 240 ÷ 3



Use basic facts and place value to find the quotient.

1. 280 ÷ 4	2. 1,800 ÷ 9
What division fact can you use?	What division fact can you use?
280 = tens 28 tens ÷ 4 = tens	1,800 = hundreds 18 hundreds ÷ 9 = hundreds
280 ÷ 4 =	1,800 ÷ 9 =
3. 560 ÷ 7 =	4. 180 ÷ 6 =
5. 1,500 ÷ 5 =	6. 3,200 ÷ 4 =
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Dividend Riddles

Solve each riddle.

- When divided by 5, I am 60. When divided by 6, I am 50. What number am I?
- 2. When divided by 3, I am 700. When divided by 7, I am 300. What number am I?

- **3.** When divided by 8, I am 70. When divided by 7, I am 80. What number am I?
- 4. When divided by 7, I am 400. When divided by 4, I am 700. What number am I?

- 5. When divided by 6, I am 200. When divided by 4, I am 300. What number am I?
- 6. When divided by 8, I am 30. When divided by 6, I am 40. What number am I?
- **7. Stretch Your Thinking** Find the sum of the six answers to the riddles. Write your own riddle so that the answer is this sum.

Estimate Quotients Using Compatible Numbers

Compatible numbers are numbers that are easy to compute mentally. In division, one compatible number divides evenly into the other. Think of the multiples of a number to help you find compatible numbers. Estimate. 6)216 **Step 1** Think of these multiples of 6: 6 12 18 24 30 36 42 48 54 Find multiples that are close to the first 2 digits of the dividend. <u>18</u> tens and <u>24</u> tens are both close to <u>21</u> tens. You can use either or both numbers to estimate the quotient. Step 2 Estimate using compatible numbers. 216 ÷ 6 216 ÷ 6 ↓ ↓ $180 \div 6 = 30$ $240 \div 6 = 40$ So, 216 \div 6 is between <u>30</u> and <u>40</u>. Step 3 Decide whether the estimate is closer to 30 or 40. 216 - 180 = 36 240 - 216 = 24216 is closer to 240, so use 40 as the estimate.

Use compatible numbers to estimate the quotient.

1.	3)252	2. 6)546	3. 4)2,545
4.	5)314	5. 2)1,578	6. 8)289

Make the Best Estimate

One of the division expressions in columns A, B, and C is the best match for the Estimate column. Circle the best choice for each.

Estimate	А	В	с
1. 70	408 ÷ 7	8) 545	816 ÷ 9
2. 80	3)251	342 ÷ 5	477 ÷ 7
3. 90	332 ÷ 5	8)628	9)780
4. 40	9)350	423 ÷ 8	538 ÷ 9
5. 100	410 ÷ 2	593 ÷ 6	4)849
6. 400	4)1,584	5)1,126	712 ÷ 3
7. 200	2,384 ÷ 5	3,006 ÷ 8	1,742 ÷ 9
8. 700	2,663 ÷ 5	6)3,411	7)5,026
9. 300	2)532	4)767	2)289
10. 120	628 ÷ 8	3)296	483 ÷ 4
11. 50	115 ÷ 4	4)198	317 ÷ 5
12. 20	8)274	221 ÷ 7	6)141
13. 900	8,250 ÷ 9	5,740 ÷ 8	2,992 ÷ 4
14. 150	6)909	8)1,040	7)881
15. 60	256 ÷ 6	189 ÷ 3	182 ÷ 5

- **16.** Write Math What strategy did you use to help you choose the best match?
- **17. Stretch Your Thinking** Create three of your own division expressions as estimates for Exercise 15. Circle the choice that has the best estimate.

Division and the Distributive Property



Use quick pictures to model the quotient.

1. $84 \div 4 =$ ____ **2.** $54 \div 3 =$ ____ **3.** $68 \div 2 =$ ____ **4.** $65 \div 5 =$ ____ **5.** $96 \div 8 =$ ____ **6.** $90 \div 6 =$ ____

True or Not True?

The Associative Property of Multiplication states that when you change the grouping of factors, the product remains the same: $(3 \times 4) \times 5 = 12 \times 5$, or 60, and $3 \times (4 \times 5) = 3 \times 20$, or 60.

Is the Associative Property also true for division? Complete Exercises 1–4.

- **1.** $(8 \div 4) \div 1 = _$ and $8 \div (4 \div 1) = _$
- **2.** $(10 \div 2) \div 1 = _$ and $10 \div (2 \div 1) = _$
- **3.** When you changed the grouping in Exercises 1 and 2, what happened to the quotient?
- **4.** Now use the numbers 2, 4, and 8 to write and evaluate a division expression. Then change the grouping of the numbers and evaluate the new expression.

- **5.** When you changed the grouping in Exercise 3, what happened to the quotient?
- 6. Write Math Is the Associative Property true for division? Explain.

Divide Using Repeated Subtraction

You can use repeated subtraction to divide. Use repeated subtraction to solve the problem.				
Nestor has 27 shells to make bracelets. He needs 4 shells for each bracelet. How many bracelets can he make? Divide. 27 \div 4				
Step 1	4)27		Step 2	
Subtract the divisor until the remainder is less than the divisor. Record a 1 each time you subtract.	$ \begin{array}{r} -4 \\ 23 \\ -4 \\ 19 \\ -4 \\ 15 \\ -4 \\ 11 \\ -4 \\ 7 \\ -4 \\ 3 \end{array} $	1 1 1 1 1	Count the number of times you subtracted the divisor, 4. 4 is subtracted six times with 3 left. 27 ÷ 4 <u>6 r3</u>	
So, Nestor can make 6 bracelets. He will have 3 shells left.				

Use repeated subtraction to divide.

1. 30 ÷ 4	2. 24 ÷ 5	3. 47 ÷ 7

Subtraction Situations

Each situation below involves repeated subtraction. Read each situation. Use the given information to solve the related division problem. Explain your reasoning.

- There are 51 fourth-graders going on a field trip. One group of 16 students rides in one van. A second group of 16 students rides in a second van. A third group of 16 students rides in a third van. The 3 students who are left ride in a car.
- Kate bakes 144 cookies for a bake sale. She places 3 cookies in one bag, 3 cookies in a second bag, and so on, until there are no cookies left. She has 48 bags of 3 cookies each.

Find the quotient. 144 \div 9

Find the quotient. 51 \div 8

3. Write Math Describe how the given situations helped you solve the division problems.

Divide Using Partial Quotients

You can use partial quotients to divide.	
Divide. 492 ÷ 4 Step 1 Subtract greater multiples of the divisor. Repeat if needed.	$4)\overline{492}$ -400 Partial quotients $-400 = 100 \times 4 = 100$
Step 2 Subtract lesser multiples of the divisor. Repeat until the remaining number is less than the divisor.	$ \begin{array}{c} $
Step 3 Add the partial quotients.	0 123
Use rectangular models to record partial quotients.	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
	4 400 80 12 - 80 12
100 20 2 122	100 20 3 12 4 400 80 12 - 12
100 + 20 + 3 = 123	

Divide. Use partial quotients.

Divide. Use rectangular models to record the partial quotients.

1. 3)657		
	100 ×	100
	100 ×	
	×	
	×	+

Special Delivery

Mailbox #2 only accepts letters with numbers that can be evenly divided by 2.

Mailbox #3 only accepts letters with numbers that can be evenly divided by 3.

Mailbox #5 only accepts letters with numbers that can be evenly divided by 5.

1. Deliver the letters by writing each number below the correct mailbox. Some letters will be undeliverable.



Write Math Could any letter be delivered to all three mailboxes?
 Explain your reasoning.

Model Division with Regrouping



Divide. Use base-ten blocks.

1. 37 ÷ 2

2. 74 ÷ 3

3. 66 ÷ 5

Lesson 4.9 Enrich

Division Drying

To find the answer to the riddle, complete each division. Then use the KEY to find the answer to the riddle.

1. 78 ÷ 6	2. 58 ÷ 3	3. 92 ÷ 4
4. 88 ÷ 7	5. 57 ÷ 2	6. 89 ÷ 5

KEY:	А	D	E	L	0	Т	U	V	W
	13	23 r1	28 r1	17 r4	23	19 r1	17 r2	16 r2	12 r4

Riddle: The more I dry, the wetter I get. What am I?

1 2 3 4 5 6

7. Stretch Your Thinking Make up a new division problem for Exercise 2 so that when using the quotient and the key, the result will be the answer to this riddle: "What is the difference between SHELL and SHALL?"

Place the First Digit

Divide. 763 ÷ 3 =	
Step 1 Estimate. Then divide the hundreds.	2 — Divide 7 hundreds by 3.
Think: 3×1 hundred = 3 hundreds 3×2 hundreds = 6 hundreds 3×3 hundreds = 9 hundreds	$\frac{3763}{-6} \leftarrow Multiply. 3 \times 2 hundreds$ $\frac{-6}{1} \leftarrow Subtract.$
3 × 3 hundreds is greater than 7 hundreds. Use 2 hundreds as an estimate.	
Step 2There is $2 \\ 3)763$ 1 hundred left over. $-6 \checkmark$	25 ← Divide 16 tens by 3. 3)763 - 6
Regroup 1 hundred, 16 ← 16 tens now there are 16 tens. Divide the tens.	$ \begin{array}{c} 16 \\ -15 \\ \hline 1 \\ \hline \end{array} \text{Multiply. } 3 \times 5 \text{ tens} \\ \hline \text{Subtract.} \end{array} $
Step 3 There is 1 ten $3)763$ left over. Regroup 1 ten, -6 now there are 13 ones.16Divide the ones. $-15\sqrt{15}$	
1 3 ← 13 ones	$\frac{-12}{12} \leftarrow Multiply. 3 \times 4 \text{ ones}$
Step 4 Check to make sure that the remainder is less than the divisor. Write the answer.	254 r1 1 < 3 3)763

Divide.

1. 2)531

2. 4)628

3. 9)349

4. 7)794

How Many Digits?

Circle how many digits will be in the quotient. Find the quotient to check that you are correct. Then, look at the riddle below. To answer the riddle, write the letter of the number you circled on the line above the exercise number.

1.
$$346 \div 2 = _$$
 2. $108 \div 9 = _$
 $1 = P$
 $2 = R$
 $3 = N$

 1 = P
 $2 = R$
 $3 = N$

 3. $652 \div 4 = _$
 1 = T
 $2 = A$
 $3 = C$

 1 = L
 $2 = I$
 $3 = H$
 $4 \cdot 210 \div 5 = _$
 $1 = R$
 $2 = S$
 $3 = N$

 5. $120 \div 8 = _$
 $1 = R$
 $2 = S$
 $3 = N$
 $1 = R$
 $2 = S$
 $3 = N$

 5. $120 \div 8 = _$
 $1 = S$
 $2 = C$
 $3 = W$
 $6 \cdot 162 \div 6 = _$
 $1 = G$
 $2 = E$
 $3 = J$

 7. $420 \div 7 = _$
 $1 = G$
 $2 = E$
 $3 = I$
 $1 = K$
 $2 = E$
 $3 = I$

 What can run but cannot walk?

 $\overline{7}$
 $\overline{2}$
 $\overline{5}$
 $\overline{3}$
 $\overline{8}$
 $\overline{1}$
 $\overline{6}$
 $\overline{4}$

Divide by 1-Digit Numbers

Divide. 766 ÷ 6 =	
Step 1 Use place value to place the first digit. Think: 7 hundreds can be shared among 6 groups without regrouping.	 1 ← The first digit is in the 6)766 hundreds place.
Step 2 There is $6\overline{)766}$ 1 hundred left over. $-6\overline{4}$ Begroup 1 hundred. 16 tens	12 ← Divide 16 tens by 6. 6)766 <u>- 6</u> 16
now there are 16 tens. Divide the tens.	$-12 \longleftarrow \text{ Multiply. 6} \times 2 \text{ tens}$ $4 \longleftarrow \text{ Subtract.}$
Step 3 There are 4 tens left over. Regroup 4 tens, now there are 46 ones. $ \frac{12}{6)766} \\ -6 \\ 16 \\ -12 \\ 46 < 46 ones $	$ \begin{array}{r} 127 \\ $
	$\frac{-42}{4} \leftarrow Multiply. 6 \times 7 \text{ ones}$
Step 4 Check to make sure that the remainder is less than the divisor. Write the answer.	<u>127</u> r4 4 < 6 6)766
Step 5 Use multiplication and addition to check your answer.	$\begin{array}{rrrr} 127 & \longleftarrow \text{ quotient} \\ \underline{\times 6} & \longleftarrow \text{ divisor} \end{array}$
	+ 4 ← remainder 766 ← dividend

Divide and check.

1. 4)868

2. 2)657

3. 7) 8,473

What Is Left Over?

Find the "leftover" in each situation. Then use the code key to see which letters match each of your answers. Write the letters in order of the exercises to find the answer to the riddle.

- **1.** Jude puts 6 lemons in each bag. If he has 170 lemons, how many will be left over?
- 2. Selena has a piece of ribbon that is 130 inches long. If she wants to make bracelets that are 9 inches long, how many inches of ribbon will be left over?
- **3.** Justin prepares 229 hamburgers for a company picnic. If buns come in packages of 8, how many will be left over?
- 4. Mrs. Bradley has \$204 to divide equally between her7 grandchildren. How many dollars will she have left over?
- **5.** Mr. White has 115 tulips for bouquets. He puts 9 tulips in each bouquet. How many tulips will be left over?

1	2	3	4	5	6	7	8
G	F	Е	L	Α	Ν	S	Т

What flies around all day but never goes anywhere?

Problem Solving • Multistep Division Problems

There are 72 third graders and 84 fourth graders going on a field trip. An equal number of students will ride on each of 4 buses. How many students will ride on each bus?

Read the Problem	Solve the Problem			
What do I need to find?	I can model the number of students in all using a bar model			
I need to find the number of <u>students</u> who will ride on each bus.				
What information do I need to use?				
There are <u>72</u> third graders and <u>84</u> fourth graders. There will be <u>4</u> buses.				
How will I use the information?	each bus.			
I will make a bar model for each step. I will add <u>72 and 84</u> to find the total number of	<u>39</u> <u>39</u> <u>39</u> <u>39</u>			
students. I will divide by <u>4</u> to find how	156			
many students will have on each bus.	So, <u>39</u> students will ride on each bus.			

 Miranda has 180 beads for making jewelry. She buys 240 more beads. She wants to store the beads in a case with 6 sections. She wants to put the same number of beads in each section. How many beads should Miranda put in each section?

2. All 203 students at Polk School eat lunch at the same time. One day 19 students were absent. If 8 students sit at each table in the lunchroom, how many tables were used that day at lunch?

Lesson 4.12 Enrich

Name _

It's a Riddle!

Solve each problem. Look for the answer in the riddle below and write the letter of the problem on the line. Not all letters will be used.

C	Maria takes 24 photos at the circus and 72 photos on her vacation. If each page in her scrapbook can hold 6 photos, how many pages can Maria fill?	I	Carmen and Wayne sell 25 birdhouses at a craft fair. They share the money equally. If each birdhouse costs \$14, how much money will Carmen and Wayne each receive?
R	José uses 3 flowers for each corsage he makes. He has orders for 18 corsages each from two different stores. How many flowers will he need?	L	Mr. Davis sells sleeping bags. He has 30 red sleeping bags and 26 green sleeping bags to put on shelves. Each shelf can hold 8 sleeping bags. How many shelves can he fill?
Y	Taren makes 62 chocolate chip cookies and 74 oatmeal cookies. If she places 8 cookies on a plate for the bake sale, how many plates will Taren need?	т	Keisha bought 10 bags of apples. There are 15 apples in each bag. If Keisha repacks the apples into 5 bags, how many apples will be in each bag?
N	Chan and his two sisters make and sell jewelry. They sell each piece of jewelry for \$9 and agree to share the money equally. If they sell 38 pieces of jewelry in all, how much money will each person receive?	E	Linh orders 16 blueberry muffins and 24 cranberry muffins from a bakery. The bakery places 8 muffins in each package. How many packages will Linh have to pick up?

Which city has no people?