

Strategies
To
Achieve
Mathematics
Success

Name _____



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Lesson 5 ZEROS IN THE QUOTIENT

PART ONE: Learn About Using Models to Divide by 1 Digit



How can you model division with zero in the quotient?

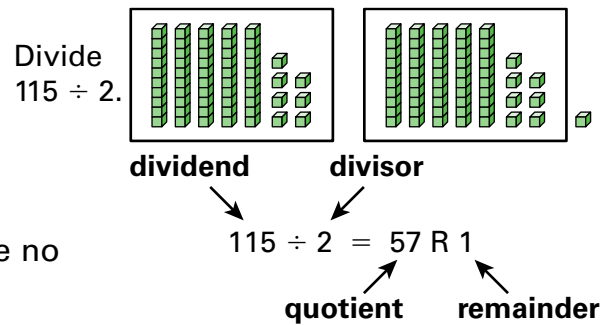
Explore

To **divide** means to separate a whole into equal groups.

You can use models to divide by separating base-ten blocks into equal groups.

What does it mean when there are no tens blocks in the equal groups?

How would you model $323 \div 3$?



Think

Use 3 hundreds, 2 tens, and 3 ones to show 323.

Divide the blocks into 3 equal groups.

Find how many hundreds, tens, and ones are in each group.

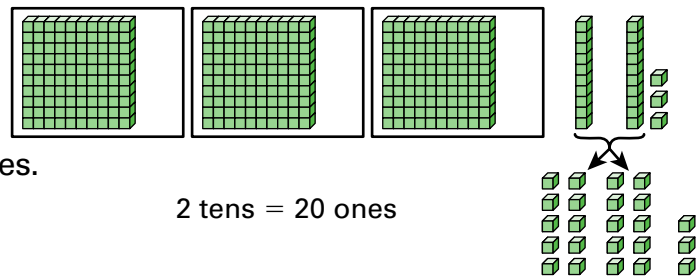
Connect

Separate the blocks into 3 equal groups.

Regroup the 2 tens as 20 ones. Now there are 23 ones.

Separate the 23 ones into 3 equal groups.

Look at each group. There are 107 in each group, with 2 left over. The quotient is 107, with a remainder of 2.



There are no tens blocks, so there is a 0 in the tens place of the quotient.

Let's Talk

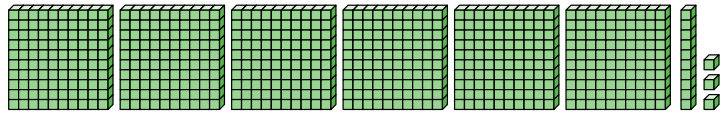
How is the quotient of 107 different than a quotient of 17?
What does the zero in 107 represent?



Think It Through

Fill in the blanks. Solve the problem.

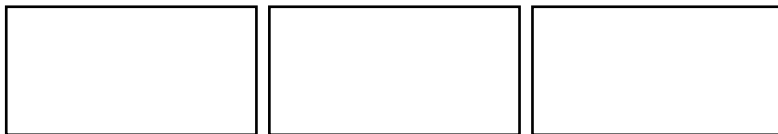
Sunni is dividing 613 quarters equally among 3 jars.



How many quarters are in each jar?

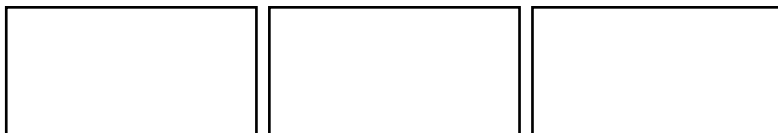
What blocks are used to model 613?
_____ hundreds, _____ ten, and _____ ones

Draw a model to divide the hundreds into _____ equal groups.



There are not enough tens to be split among the groups. So, there are _____ tens in each group. Regroup the leftover ten as _____ ones.

There are _____ ones in all. Draw to divide the ones into equal groups.



For any division problem, the remainder must be less than the divisor. Otherwise, you could keep dividing among the equal groups.



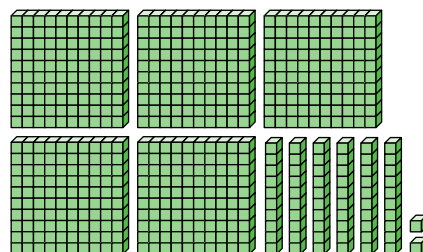
Solution: There are _____ quarters in each jar, and there is _____ left over.

Your Turn

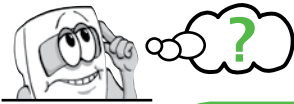
Now, use what you know to solve this problem.

1. Use these blocks to help you divide 562 into 4 equal groups. How much is in each group? Draw a model.

- (A) 104 R 2
- (B) 140 R 0
- (C) 140 R 2
- (D) 142 R 0



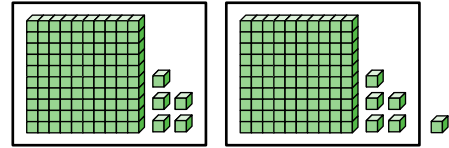
PART TWO: Learn About Writing Zero in the Quotient



When do you write zero in the quotient?

Explore

When you use models to divide 3-digit numbers, you find how many hundreds, tens, and ones are in the quotient. If there are no tens or ones, use a 0 for that place.



$$211 \div 2 = 105 \text{ R } 1$$

↑
zero tens

How can you find a quotient that has a zero without using models? $843 \div 4$

Think

Divide 843 by 4. Divide 843 into 4 equal groups. Find how many hundreds, tens, and ones are in each group. 843 has 8 hundreds, 4 tens, and 3 ones.

Connect

Follow these steps to find $4\overline{)843}$ using **long division**.

1. Divide 8 hundreds into 4 equal groups. Write **2** in the quotient. Multiply **2** hundreds by the divisor, 4. Write **800** and *subtract*.

$$\begin{array}{r} \times \quad 2 \\ 4\overline{)843} \\ \underline{-800} \\ 43 \end{array}$$

2. Divide 4 tens into 4 equal groups. Write **1** in the quotient. Multiply **1** ten by 4. Write **40** and *subtract*.

$$\begin{array}{r} \times \quad 21 \\ 4\overline{)843} \\ \underline{-800} \\ 43 \\ \underline{-40} \\ 3 \end{array}$$

3. Divide 3 ones into 4 equal groups.

Since you cannot divide 3 ones into 4 groups, write **0** in the ones place. Multiply **0** by 4 and *subtract*.

The 3 left over is the remainder.

$$\begin{array}{r} \times \quad 210 \\ 4\overline{)843} \\ \underline{-800} \\ 43 \\ \underline{-40} \\ 3 \\ \underline{-0} \\ 3 \end{array}$$

The quotient is 210, with a remainder of 3. Write $843 \div 4 = 210 \text{ R } 3$.

Let's Talk

When should you write a 0 in the quotient of a division problem? Give an example of a division problem that has no zeros in the quotient.



Think It Through

Fill in the blanks. Solve the problem.

Carolina is separating 548 cans among 5 recycling bins equally.

How many cans are in each bin?

■ Divide ____ into ____ equal groups.

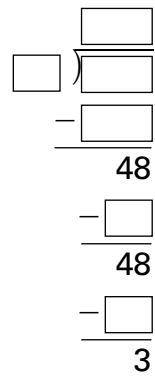
548 has ____ hundreds, ____ tens, and ____ ones.

■ Write the problem. $\square \overline{) \square \square \square}$

Divide 5 hundreds into ____ equal groups. \longrightarrow
Write ____ in the quotient.

Divide 4 tens into ____ equal groups. \longrightarrow
Write ____ in the quotient.

Divide 48 ones into ____ equal groups. \longrightarrow
Write ____ in the quotient.



■ The quotient is ____, with a remainder of ____.

Write ____ R ____.

Solution: Each bin has ____ cans, and there are ____ left over.

Not all division problems will have a zero in the quotient. When dividing a 3-digit number, only write a 0 when tens or ones are not great enough to divide into equal groups.



Your Turn

Now, use what you know to solve this problem.

2. Bookstore employees choose a total of 325 books to put on display. They divide the books evenly among 8 shelves. How many books are on each shelf?

Show your work.

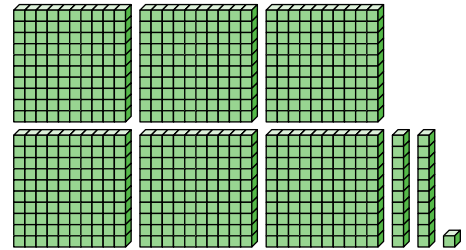
There are ____ books on each shelf, with ____ books left over.

PART THREE: Choose the Right Answer

Solve the problem. Then read why each answer choice is correct or not correct.

Solve

A DVD manufacturer is packing 621 DVDs into 3 large boxes, with the same number of DVDs in each box. How many DVDs will be in each box?



- Ⓐ 270, 1 left over Ⓒ 207, 0 left over
 Ⓑ 207, 1 left over Ⓓ 27, 0 left over

Check

Check to see if you chose the correct answer.

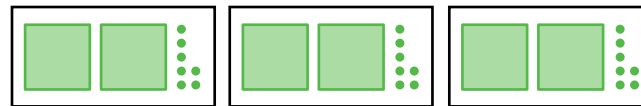
To find the number of DVDs in each box, divide 621 by 3.

Divide the 6 hundreds into 3 groups. There are 2 hundreds in each group.



There are 2 tens. Since the tens cannot be divided into 3 groups, regroup the tens as 20 ones. Now, there are 21 ones.

Divide the 21 ones into 3 groups. There are 7 ones in each group.



There are 0 ones left over.

So, the correct answer is Ⓒ.

Why are the other answer choices not correct?

Ⓐ 270, 1 left over	There are 0 tens in each group, so write a zero in the tens place of the quotient, not the ones place.
Ⓑ 207, 1 left over	The remainder is the number left over, not the number of ones in the dividend.
Ⓓ 27, 0 left over	There are 0 tens in each group, not 2. A zero is needed in the tens place of the quotient.

Your Turn

Solve each problem. Use the hints to avoid mistakes.



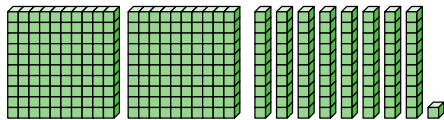
- Regroup as needed if you can't divide evenly into groups.
- Carefully write each number of the quotient in the correct place value, using 0 when the tens or ones are not great enough to divide into the groups.
- Check for a remainder and record it.

3. Which place will have to be regrouped, if any, in the following problem?

$$3 \overline{)692}$$

- (A) hundreds
- (B) tens
- (C) ones
- (D) none

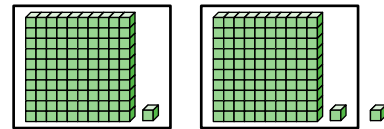
4. Steven modeled 281 using base-ten blocks.



He divides the blocks into 4 equal groups. What are the quotient and remainder?

- (A) 20 R 0
- (B) 70 R 0
- (C) 70 R 1
- (D) 120 R 1

5. Which division problem is shown by the model of a quotient and remainder?



- (A) $2 \overline{)201}$
- (B) $2 \overline{)203}$
- (C) $203 \overline{)2}$
- (D) $2 \overline{)101}$

6. Jonah is helping to set up chairs for the school play. There are 530 chairs, and he places them in rows of 5 chairs each. How many rows will there be?

- (A) 16
- (B) 100 R 6
- (C) 106
- (D) 160

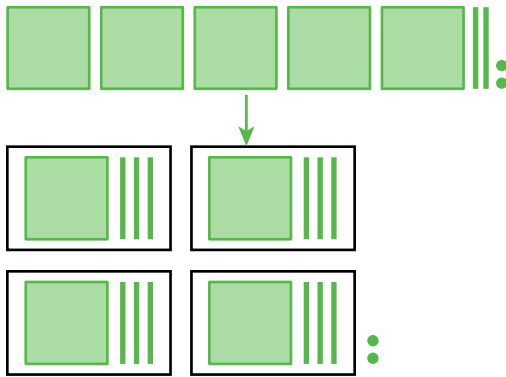
Study the model. It is a good example of a written answer.

Student Model

Show

Luther is separating 522 baseballs into 4 equal groups. How many baseballs will be in each group? How many are left over? Use a model and long division to show your work.

Model



Long Division

$$\begin{array}{r}
 130 \\
 4 \overline{)522} \\
 \underline{-400} \\
 122 \\
 \underline{-120} \\
 2 \\
 \underline{-0} \\
 2
 \end{array}$$

Solution: 130 baseballs, with 2 left over

Explain

Explain how you got your answer.


First, I drew a model of the dividend using base-ten blocks. The divisor is 4, so I separated the blocks into 4 equal groups. I divided the hundreds and regrouped the leftover hundred as 10 tens. Next, I divided the tens. There are only 2 ones, not enough to divide among the 4 groups, so I wrote a 0 in the ones place of the quotient. The remainder is 2. I got the same answer using both ways of dividing.

✓ The student shows each step.

✓ The student correctly answers the question asked.

✓ The student gives important details about how to find the quotient and remainder.

✓ The student uses the math words *dividend*, *divisor*, *regroup*, *quotient*, and *remainder*.

Your Turn 

Solve the problem. Use what you learned from the model.

7. Marissa has 621 craft sticks to divide evenly among 3 art classes. How many craft sticks should she give to each class? Are there any left over?

Use a model and long division to show your work.



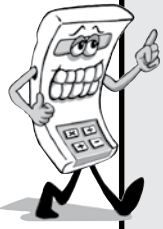
CHECKLIST

Did you . . .

- show each step?
- answer the question asked?
- give important details?
- use math words?

Solution: _____

Explain how you got your answer.

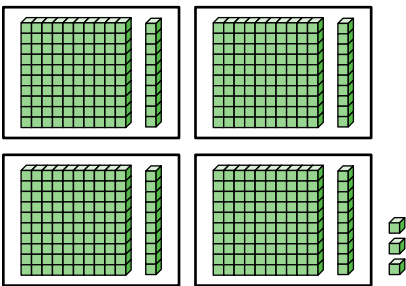


As you solve division problems, remember to

- draw pictures to show equal groups.
- carefully regroup numbers as needed.
- write a 0 in the quotient when the tens or ones are not great enough to divide into the groups.
- use multiplication to check your answer.

Solve each problem.

8. What division problem is shown by the model of a quotient and remainder?



- (A) $4 \overline{)113}$
 (B) $443 \overline{)4}$
 (C) $3 \overline{)443}$
 (D) $4 \overline{)443}$
9. A manufacturer has 843 cases of crackers to load into 4 trucks. How many cases will be in each truck? How many are left over?
- (A) 201 cases, 0 left over
 (B) 201 cases, 3 left over
 (C) 210 cases, 0 left over
 (D) 210 cases, 3 left over

10. An after-school club has raised \$873 to give equally to 3 charities. How much is in each donation?

- (A) \$221
 (B) \$231
 (C) \$290
 (D) \$291

11. A warehouse worker is packaging 954 video games into boxes. Each box holds 5 games. How many boxes does he need for all the games?

- (A) 191
 (B) 190
 (C) 111
 (D) 110

12. What is the remainder when 623 is divided by 6?

- (A) 5
 (B) 4
 (C) 3
 (D) 0

13. Kevin is separating 587 building blocks equally into 7 bags. How many blocks will be in each bag? How many blocks will be left over?

- Ⓐ 83 blocks, 0 left over
- Ⓑ 83 blocks, 6 left over
- Ⓒ 803 blocks, 6 left over
- Ⓓ 830 blocks, 6 left over

14. Tameka works at a craft store. She has to separate 274 coils of yarn equally among 9 shelves. She plans to buy the leftover coils to make a scarf.

Write the division problem and divide.

How many coils will Tameka buy?

15. Miranda and two of her friends are taking a trip. They will drive a total of 315 miles, and each will drive an equal amount. How many miles will each person drive?

Use pictures, words, or numbers to show your work.

Solution: _____

Explain how you found your answer.
