

# Breaking Down Division in Grades 3, 4 & 5

3.OA.2, 4.NBT.6 & 5.NBT.6

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## 4.NBT.6

**Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.**

**Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.**

## 5.NBT.6

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

# Using Rectangular Arrays for Sharing Division

You know the total amount and the number of groups and you need to find out how many are in each group.

Jody has 42 apples. She puts them into 6 equally sized groups. How many are in each group? There are 7 in each group.

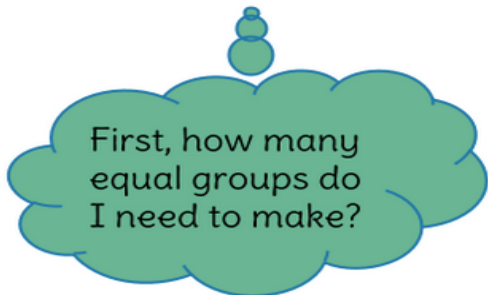
# Rectangular Arrays

## Big Ideas

Visualizing the problem is helpful when creating arrays for division.

To do this there are 3 questions to ask yourself...

$$25 \div 6$$



This tells me how many columns to make!

# Rectangular Arrays

## Big Ideas

$$25 \div 6$$

Second, how many items do I have altogether?



This tells me when to stop placing items in my columns!

# Rectangular Arrays

## Big Ideas

$$25 \div 6$$

Third, how many  
are left over?



I circle my equal  
groups, and look  
to see how many  
are left over.

My final answer  
is:

$$25 \div 6 = 4 R1$$

How do students expand their knowledge of arrays when working with larger numbers in division?

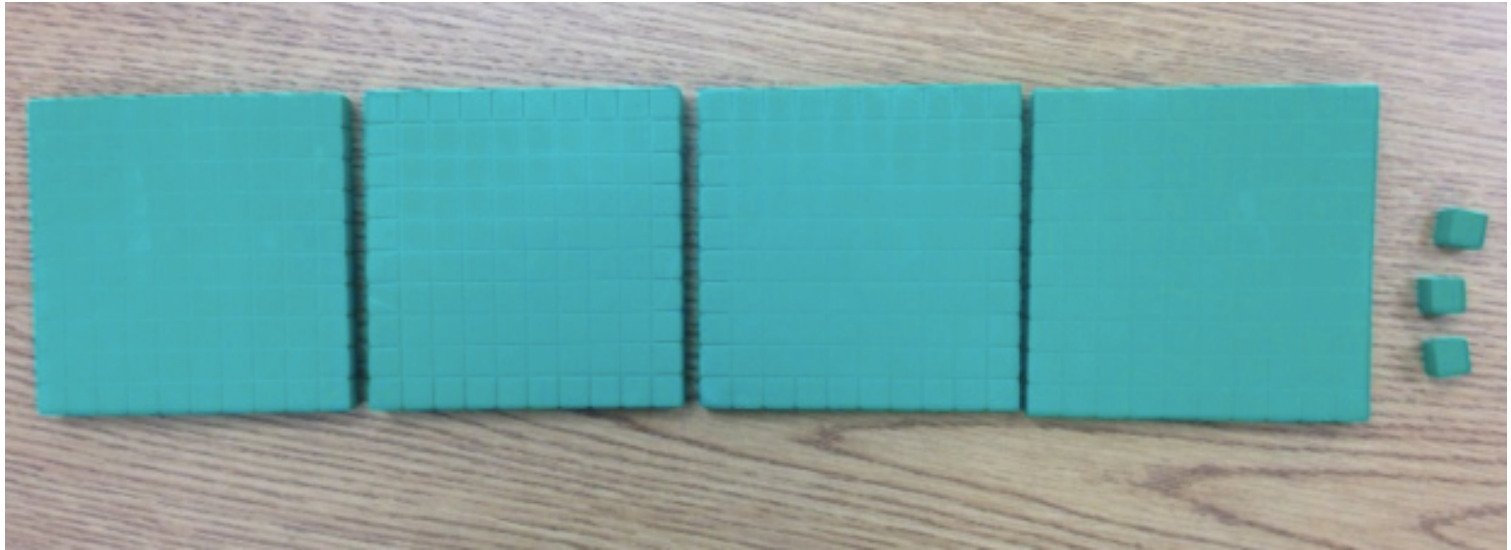
# Area Model with Base Ten Blocks

$$403 \div 13 = ?$$

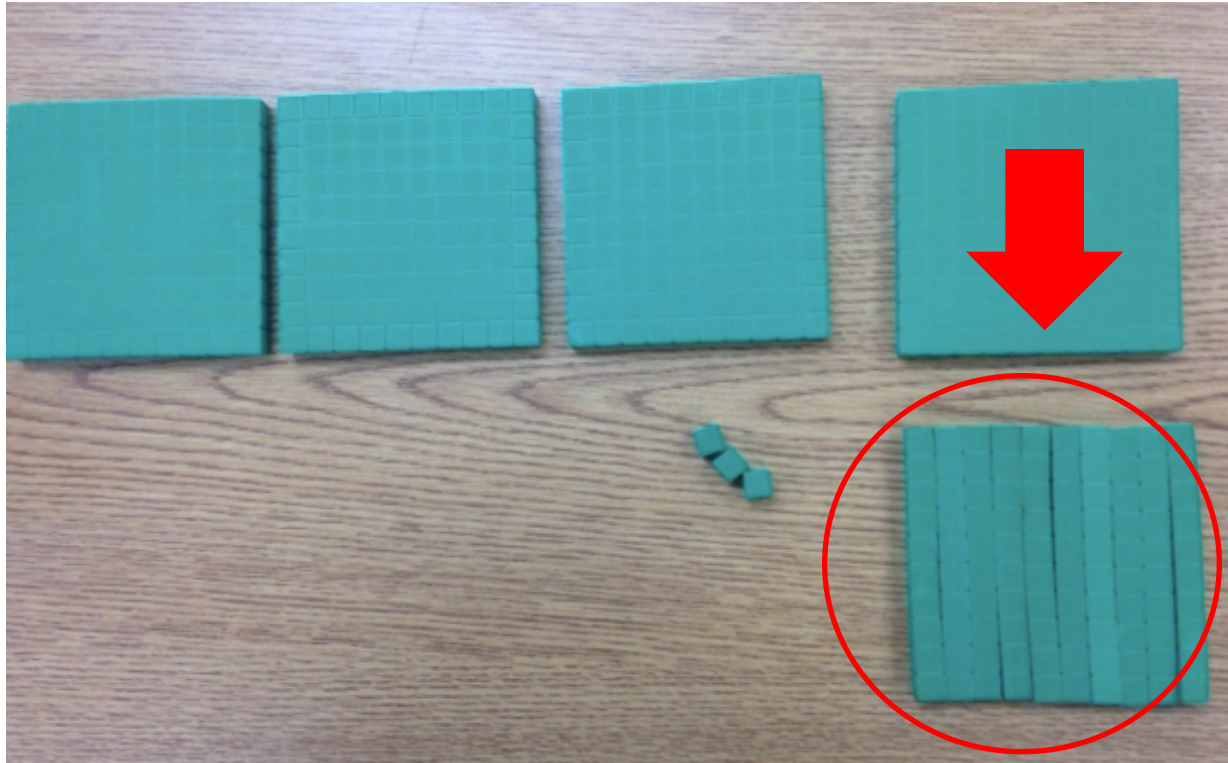
Create a visual representation to help you solve this problem.



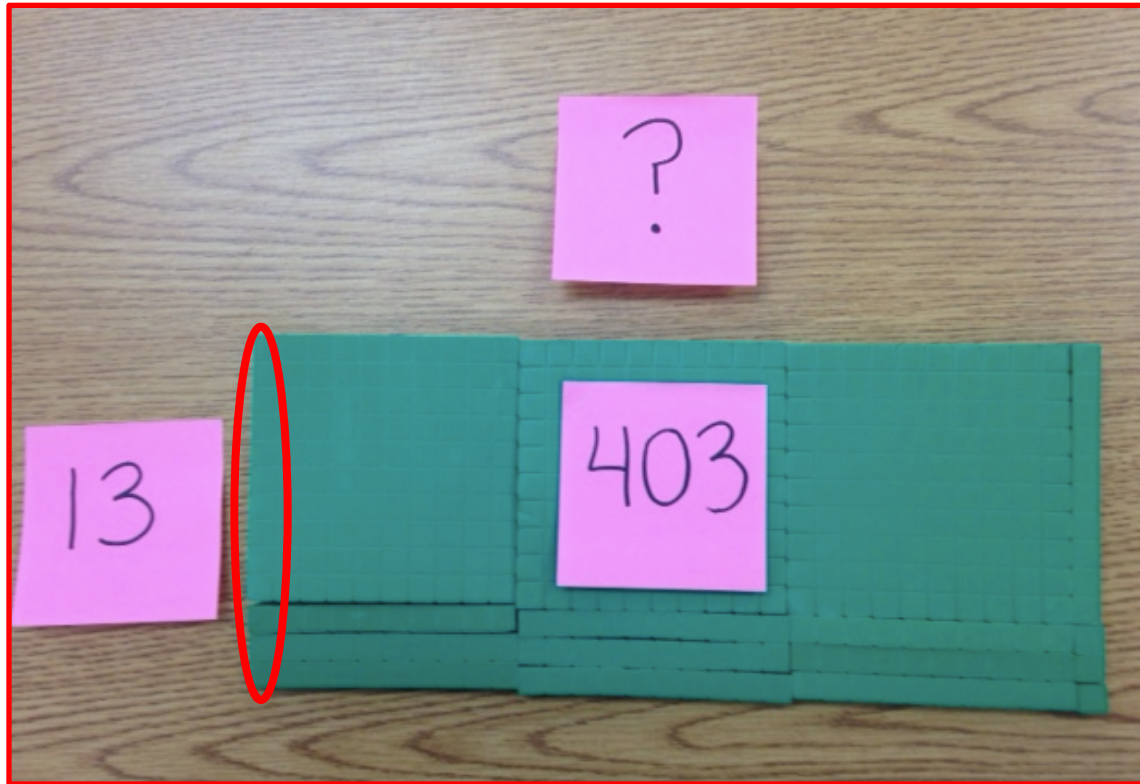
# Area Model



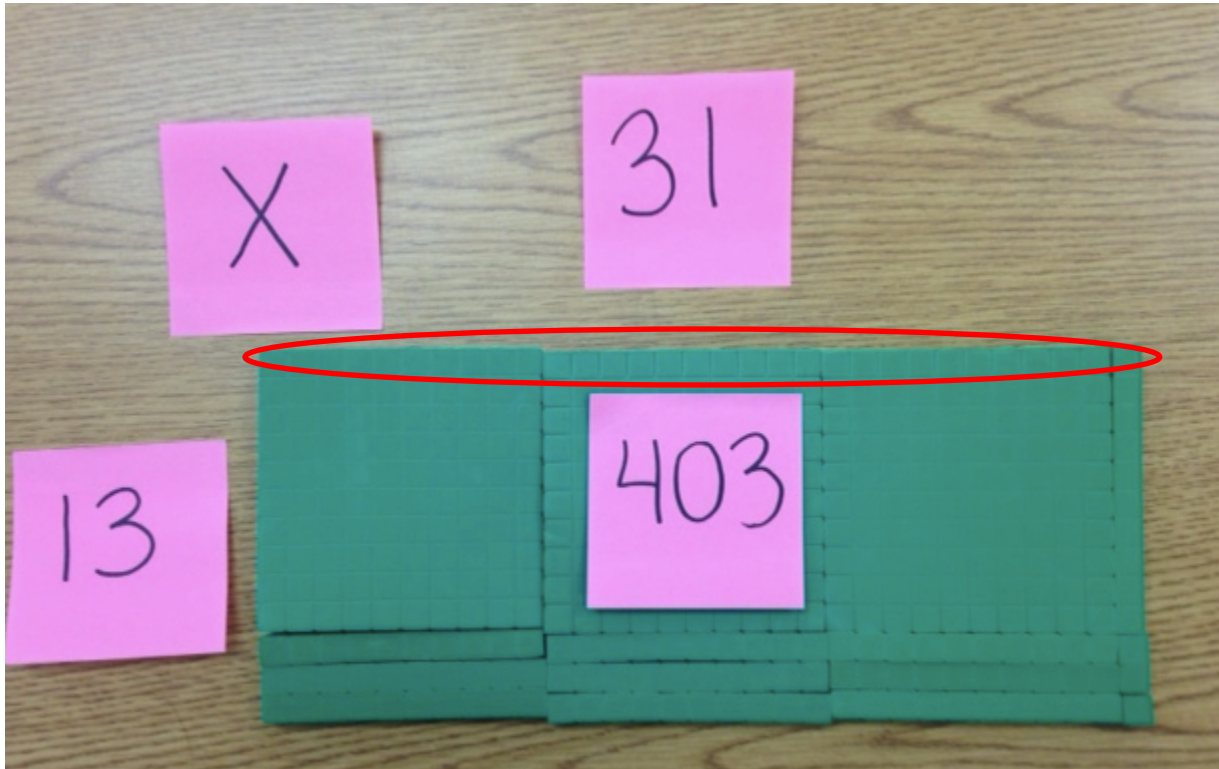
# Area Model



# Area Model



# Area Model



# Area Model

[http://www.pbslearningmedia.org/asset/mgbh\\_int\\_divmodel/](http://www.pbslearningmedia.org/asset/mgbh_int_divmodel/)

The screenshot shows an interactive interface for solving the division problem  $187 \div 11$ . At the top left, the text "WGBH" is visible. The main title is "Problem B4:  $187 \div 11$ ".

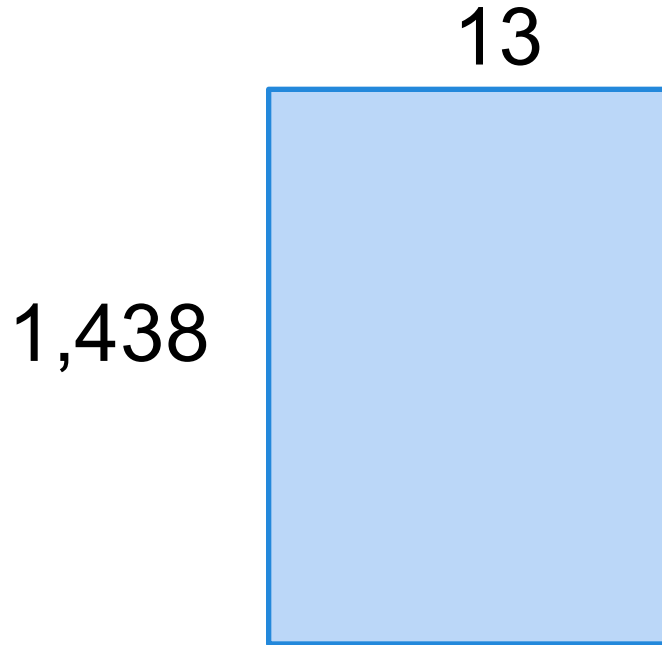
On the left side, there are two visual representations of the numbers 187 and 11. The number 187 is represented by a 10x10 grid with a mouse cursor in the center. Below it, the number 11 is represented by two vertical bars: one with 8 units and one with 7 units. The number 7 is also represented by a vertical bar with 7 units.

On the right side, there is a large grid labeled  $187 \div 11$ . The grid is divided into three horizontal sections: a top section of 10 rows, a middle section of 7 rows, and a bottom section of 10 rows. A "RESET" button is located below the grid.

At the bottom of the interface, there is a navigation bar with the following elements: "Intro" (selected), "B4", "B5", a "SOLUTION" button, and an "Open Instructions" button.

To rotate a long, hold your mouse down and press "R" once on your keypad.

# Open Array/Area for $1,438 \div 13$



Let's Take a look at a LearnZillion lesson: **LZ552**

# Let's try another example:

## 643 ÷ 25

The image shows a handwritten solution for the division  $643 \div 25$ . It consists of two parts: a box method on the left and a standard long division on the right.

**Box Method:**

	25	
10	250	
10	250	
4	100	
1	25	

The numbers 10, 10, 4, and 1 are listed in a vertical oval to the left of the boxes. The total quotient is 25.

**Standard Long Division:**

$$\begin{array}{r} 643 \\ -250 \\ \hline 393 \\ -250 \\ \hline 143 \\ -100 \\ \hline 43 \\ -25 \\ \hline 18 \end{array}$$

**Final Result:**

$$643 \div 25 = 25 \text{ r } 18$$



# Partial Quotients

## **What is it?**

Students use several steps to find the quotient by relying on known facts and multiples of 10. The process ends by adding all of the partial quotients together.

## **When do you use it?**

This strategy can be used to solve more complex division problems.

# Partial Quotients

$$1,034 \div 6 =$$

6	$\overline{)1,034}$	
	$\underline{-600}$	100
	434	
	$\underline{-300}$	50
	134	
	$\underline{-120}$	20
	14	
	$\underline{-12}$	2
	2	172

**Think:** How many [6s] are in 1,034? At least 100

The first partial quotient is 100. There are 100 groups of 6 in 1,034. Since  $100 \times 6 = 600$ , subtract 600 from 1,034.

**Think:** How many [6s] are left? At least 50. The second partial quotient is 50. Since  $50 \times 6 = 300$ , subtract 300.

**Think:** How many [6s] are left? At least 20. The third partial quotient is 20. Since  $20 \times 6 = 120$ , subtract 120

**Think:** What basic fact do I know that is close to 14?  $6 \times 2$ . The fourth partial quotient is 2. Since  $6 \times 2 = 12$ , subtract 12. Add the partial quotients.

# Partial Quotients (Chimney)

$$1,034 \div 6 =$$

$$\begin{array}{r} 2 \\ 70 \\ 100 \\ \hline 6 \overline{) 1,034} \\ \underline{- 600} \\ 434 \\ \underline{- 420} \\ 14 \\ \underline{- 12} \\ 2 \end{array} \quad 172 \text{ R } 2$$

# Quotient Cafe- <http://illuminations.nctm.org/activity.aspx?id=4197>



5 penguins divide 26 apples

**Teacher**

 5

 26

have extra objects

divide the extra objects

**START**

The image shows a digital interface for a math activity. At the top, it says '5 penguins divide 26 apples'. Below this, there are two rows. The first row features a penguin icon in a white box, followed by a horizontal line with a vertical tick mark on the left and the number '5' in a white box on the right. The second row features an apple icon in a white box, followed by a horizontal line with a vertical tick mark on the left and the number '26' in a white box on the right. To the left of these rows is a vertical blue bar with the word 'Teacher' written vertically. Below the rows are two radio button options: 'have extra objects' (which is selected) and 'divide the extra objects'. At the bottom center is a blue button with the word 'START' in yellow.

# Distributive Property

The distributive property for division basically means you can split your quantity up into smaller chunks that are easier to divide.

This property forms the basis of the written algorithm for long division.

It is important to note that the commutative, associative, identity and inverse properties do not apply to division.

Putting the Essential Understanding of Multiplication & Division into Practice 3 -

# Distributive Property in Action

Let's take  $176 \div 8$  as an example. It's easier for students to consider questions in context, so think of putting 176 apples into 8 bags.

# Distributive Property

If we take the first 80 apples, then it's easier to see that would be split up into 10 apples into each bag.  $80 \div 8$  is a much easier question. The next 80 apples are divided up, adding another 10 to each bag. That leaves 16 apples, which when divided up into 8 bags makes 2 each.

So what we've done is split  $176 \div 8$  into:

$$80 \div 8$$

$$80 \div 8$$

$$16 \div 8$$

# Distributive Property

Mike said, “ $721 \div 7$  is the same as  
 $700 \div 7 + 21 \div 7$ .”

How is Mike’s statement related to the long-division algorithm?


In what different ways would fourth- and fifth-grade students be likely to respond to Mike?





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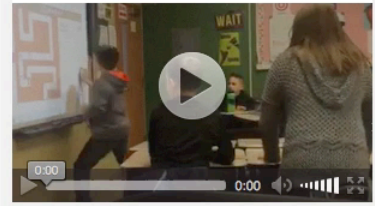


## GAMES


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**VIDEO OF THE WEEK:** Ms. Coopersmith's students playing **Ten Frame Mania!**

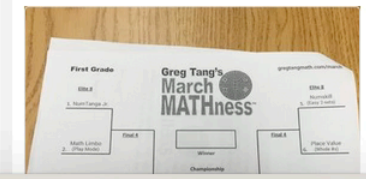


Tweets by [@gregtangmath](#)

 Greg Tang Retweeted

 **Mrs. Micele's 1st Grade**  
[@MrsMicele](#)

Discussing our March MATHness brackets! Who do you think will be in the final four?? [@gregtangmath](#)



## RESOURCES

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## Teacher Tools



### KINDERGARTEN NUMBER SENSE AND EQUIVALENCE

- Numbers to Ten on the TenFrame
- Numbers to Ten on the MathRack
- Numbers to Twenty on the TenFrame
- Numbers to Twenty on the MathRack



### THIRD GRADE NUMBER SENSE AND EQUIVALENCE

- Equivalence up to Twenty
- Equivalence up to One Hundred
- Ordering Fractions on the Number Line 0-1



### SIXTH GRADE GEOMETRY

- Coordinate Grids: Location and Measurement
- Coordinate Grids: Lines of Reflection

### SIXTH GRADE NUMBER SENSE AND PROPORTIONAL REASONING

# What connections can you make between the models?

