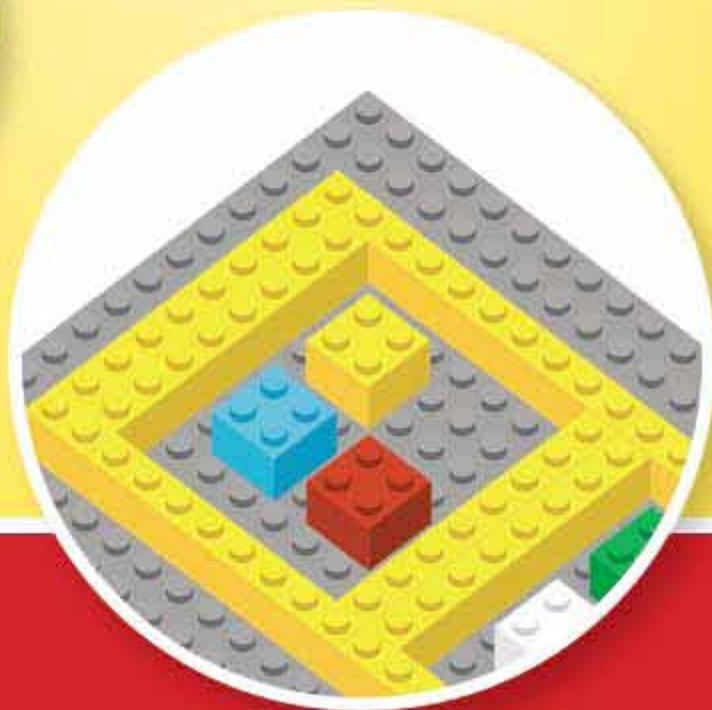
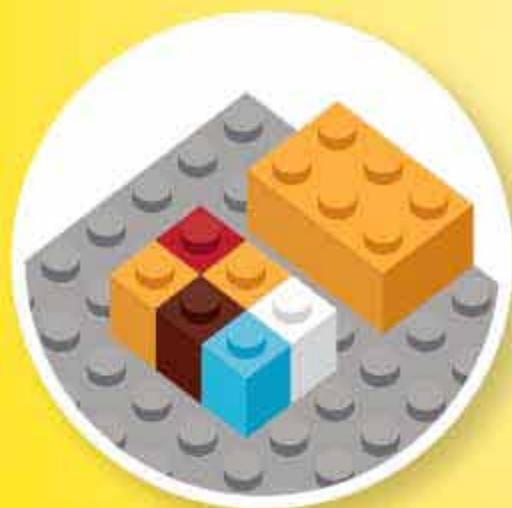


Brick Math Series

# TEACHING DIVISION USING LEGO® BRICKS



Dr. Shirley Disseler  
Math Curriculum Expert

Brick Math Series

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# EXPLORING DIVISION

## Students will learn/discover:

- How division relates to multiplication
- Why division is actually repeated subtraction
- How to model division facts
- The vocabulary:
  - **Dividend** (the number being divided)
  - **Divisor** (the number of sets)
  - **Quotient** (the solution or answer)

## Why is this important?

Students need to know what the term *divide* means. In order to have deeper understanding, students must recognize how division relates to both multiplication and repeated subtraction. This activity uses the strategy of set boxes.

Students will see that division is the opposite of multiplication by breaking down a whole into smaller sets when dividing. When multiplying, they put smaller sets together into a whole.

Students also will learn that, in the same way multiplication is repeated addition, one can think of division as repeated subtraction. When dividing, the same amount can be repeatedly subtracted from the whole until there are no more complete sets to subtract.

## Brick Math journal:

After students build their models, have them draw the models in their Brick Math journals (see page 7 for more about the Brick Math journal). Recording the models in their journals after building with the LEGO® bricks helps to reinforce the concepts and engages both the creative and logical thinking processes.

## SUGGESTED BRICKS

Size	Number
1x1	24
1x2	12
1x3	6
1x4	4
1x6	12
2x3	6
2x8	4

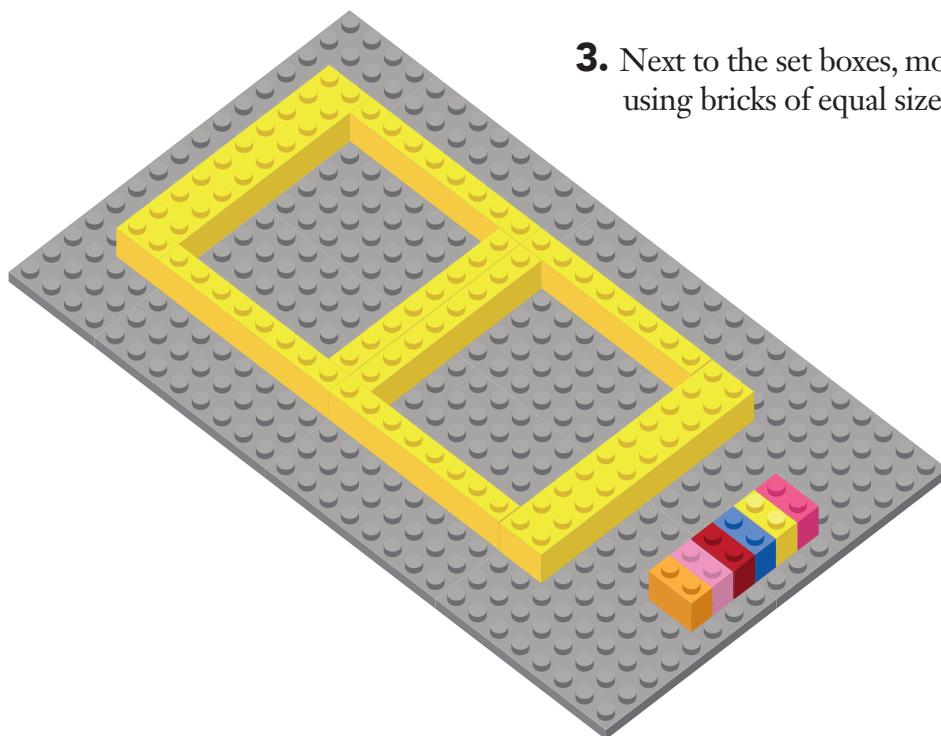
Note: A number of 1x10 or 1x12 bricks are also needed to serve as set separators.

Note: Using a base plate will help keep the bricks in a uniform line. One large base plate is suggested for these activities.



## Part 1: Show Them How

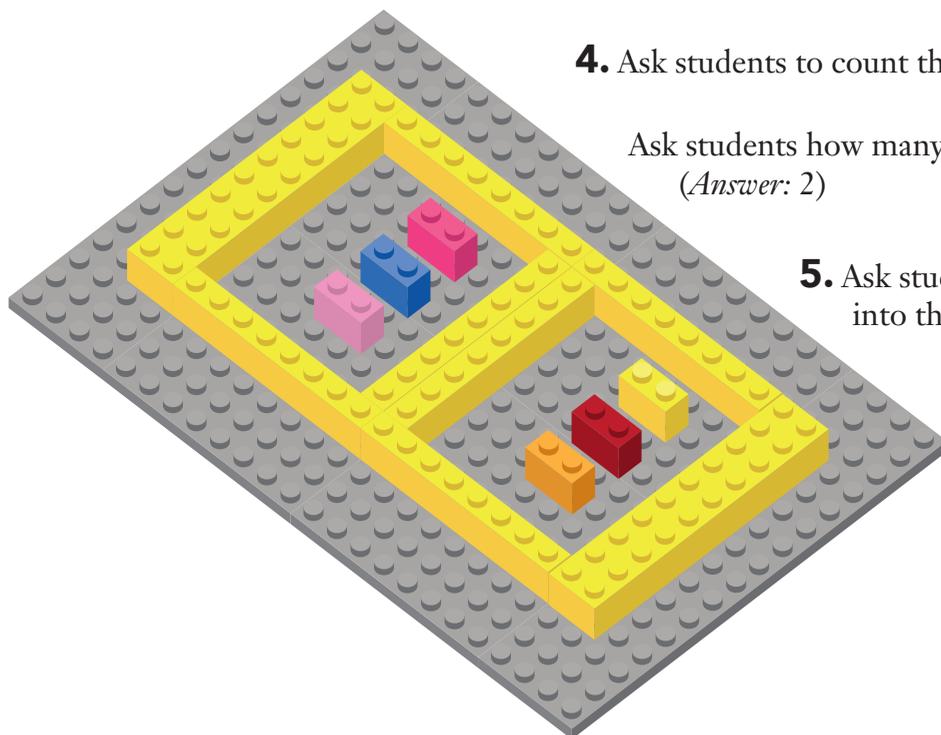
1. Build two set boxes on a large base plate using long bricks.
2. Ask students to think about the multiplication facts for 12.



3. Next to the set boxes, model the number 12 on a base plate using bricks of equal size (for example, six 1x2 bricks).

4. Ask students to count the studs. (*Answer: 12*)

Ask students how many set boxes are on the base plate.  
(*Answer: 2*)



5. Ask students to separate the 1x2 bricks into the set boxes evenly.



- 6.** Ask students how many studs are in each block.  
(*Answer:* 6)

- 7.** Discuss with students the vocabulary of the numbers.

Ask students: What do the 12 studs represent in the model? (*Answer:* the *dividend*, or the whole number being divided)

Ask students: What do the two set boxes represent in the model? (*Answer:* the *divisor*, or the number of sets the studs are being put into)

Ask students: What are the 6 studs called in each of the set boxes? (*Answer:* the *quotient*)

- 8.** Discuss with students the terminology of a division problem. Explain that the *problem* is 12 divided by 2, and the *solution* is 6 studs.

- 9.** Ask students: If we could write this problem as a multiplication problem, what would the problem look like and what would it mean? (*Answer:* 2 sets of 6 equal 12 or  $2 \times 6 = 12$ )

Ask students: Why is it not  $6 \times 2 = 12$ ? (*Answer:* There are 2 sets with 6 studs in each set, not 6 sets with 2 studs in each set)

- 10.** Show how division is like repeated subtraction.

Ask students: Is there another way to get the solution without grouping?

Show students the six 1x2 bricks. Allow students to speculate on another way to show the solution.

If needed, lead students by taking away one brick and then ask, “how many are left?” Make a table to help them understand the concept:



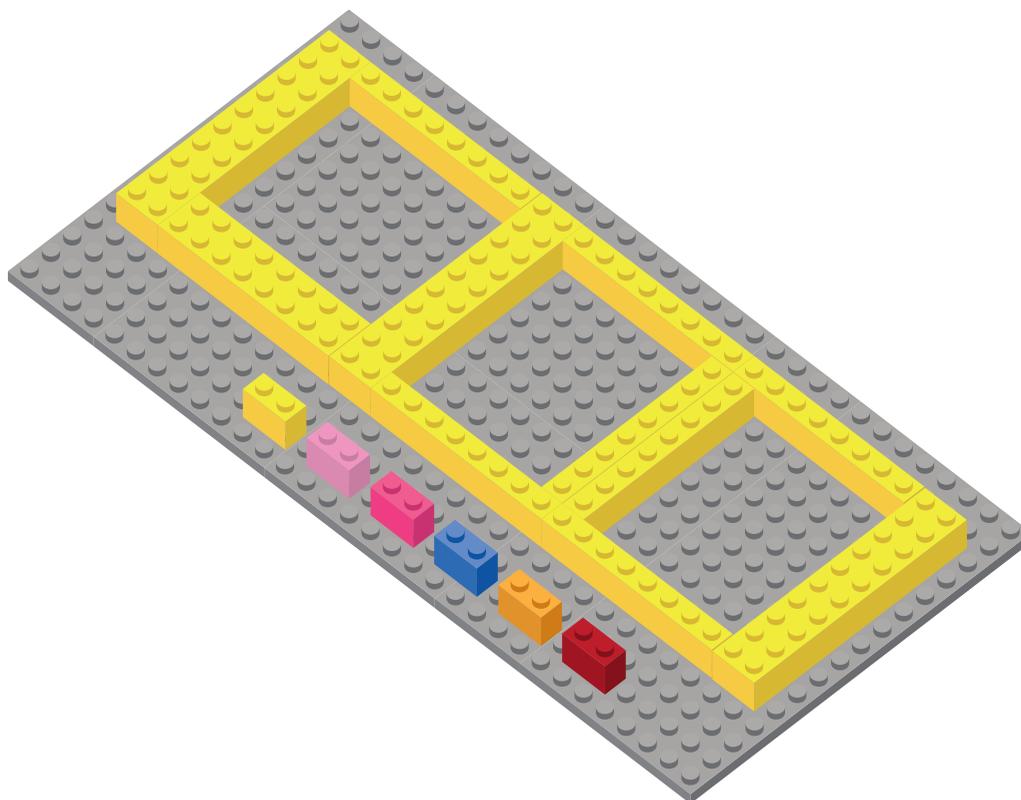
Number of studs	Number removed (subtracted)	Number left
12	2 studs removed (one 1x2 brick)	10
10	2 studs removed (one 1x2 brick)	8
8	2 removed (one 1x2 brick)	6
6	2 removed (one 1x2 brick)	4
4	2 removed (one 1x2 brick)	2
2	2 removed (one 1x2 brick)	0

Ask students, “How many times did you remove studs?”  
(*Answer: 6*)

Ask students, “How many studs were removed each time?” (*Answer: 2*)

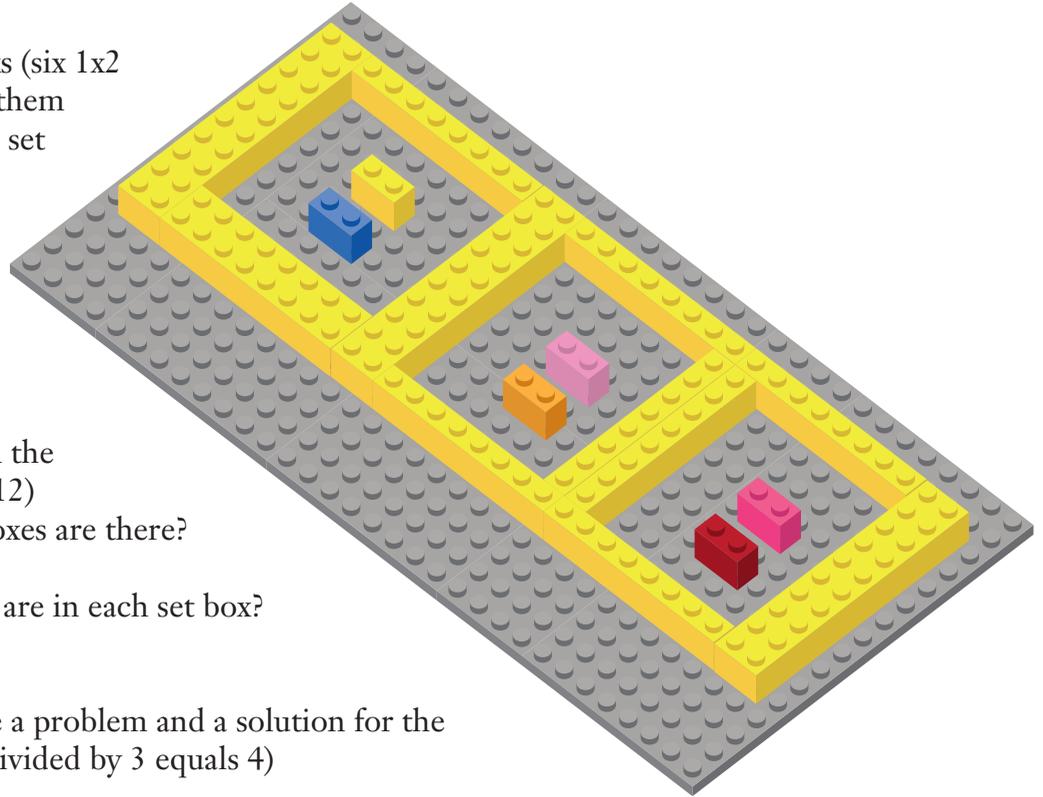
Explain that this method is called *repeated subtraction*. It is another way to show that 12 divided by 2 equals 6.

**12.** Add a third set box to the model.





13. Use the same bricks (six 1x2 bricks) and separate them evenly into the three set boxes.



14. Ask students:

- How many are in the whole? (*Answer:* 12)
- How many set boxes are there? (*Answer:* 3)
- How many studs are in each set box? (*Answer:* 4)

15. Ask students to write a problem and a solution for the model. (*Answer:* 12 divided by 3 equals 4)

16. Have students write a multiplication sentence for this problem to show the opposite operation. (*Answer:*  $3 \times 4 = 12$ )

17. Have students make a table to show the repeated subtraction that is taking place in the problem. *Answer:*

Number of studs	Number removed (subtracted)	Number left
12	4 studs removed (two 1x2 bricks)	8
8	4 studs removed (two 1x2 bricks)	4
4	4 studs removed (two 1x2 bricks)	0

Have students explain how this chart shows the solution of 3 sets.

(*Answer:* Removing 4 studs represents one set of the model. Four studs are taken away three times to get to zero.)



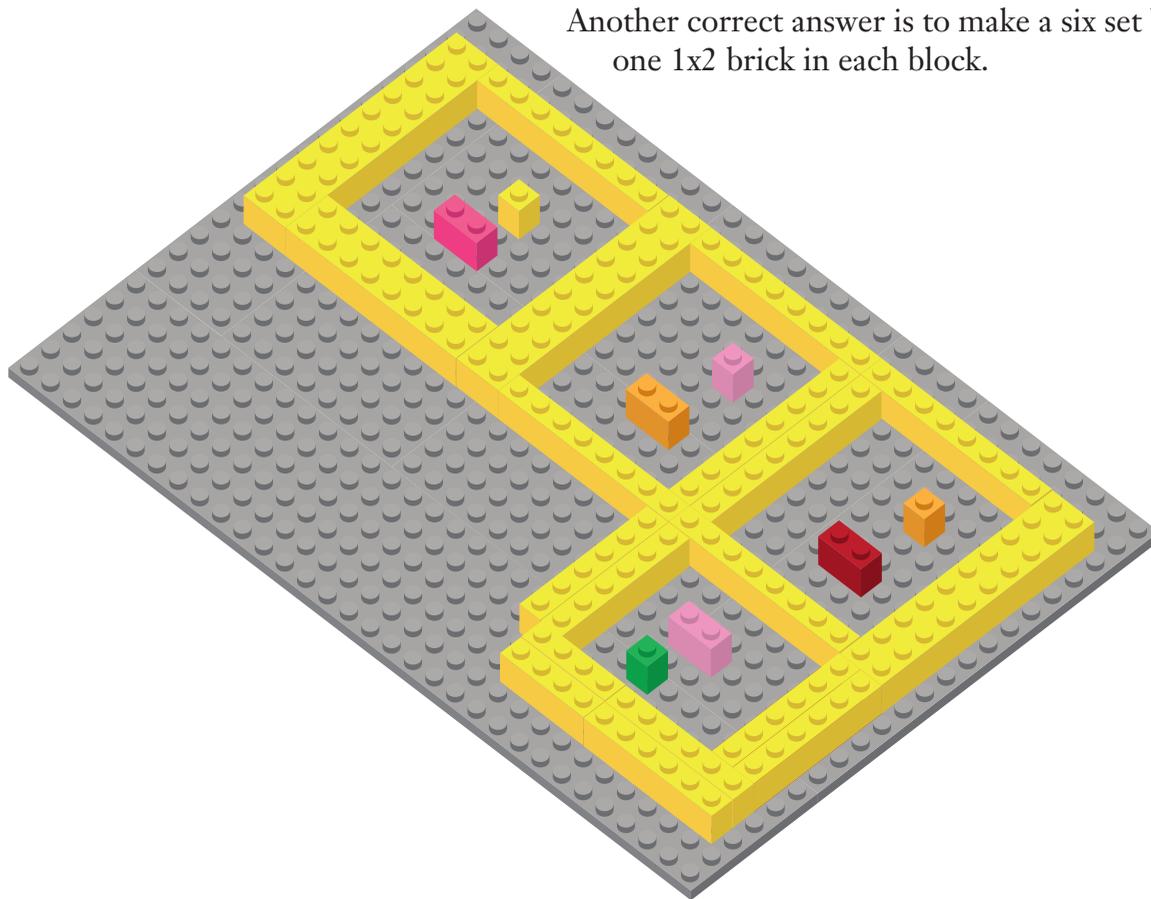
*Challenge:* Make another model of division with twelve, using the same six 1x2 bricks. You can add or take away set boxes.

Possible solutions:

Students should discover that a four set box model does not work with the 1x2 bricks. This helps them understand the idea that decomposition is required to divide, which leads to the idea of remainders in later lessons.

Students might discover that since 12 is divisible by 4, they can decompose three of the 1x2 bricks to six 1x1 bricks, which will allow them to distribute the 12 studs equally by placing 3 into each of the 4 set boxes. The solution is 12 divided by 4 equals 3.

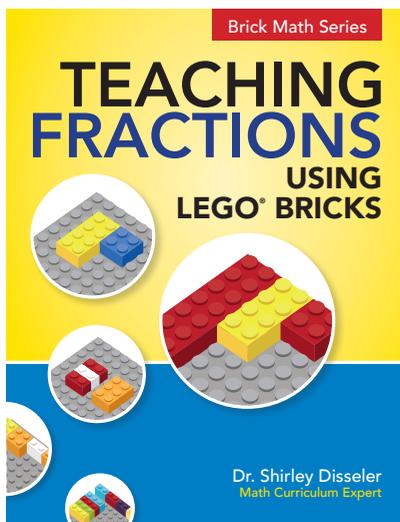
Another correct answer is to make a six set box model with one 1x2 brick in each block.



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Dr. Shirley Disseler



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Author Dr. Shirley Disseler is Associate Professor at High Point University and Chair of the Department of Elementary and Middle Grades Education. She serves on the LEGO® Education Ambassadors Panel.

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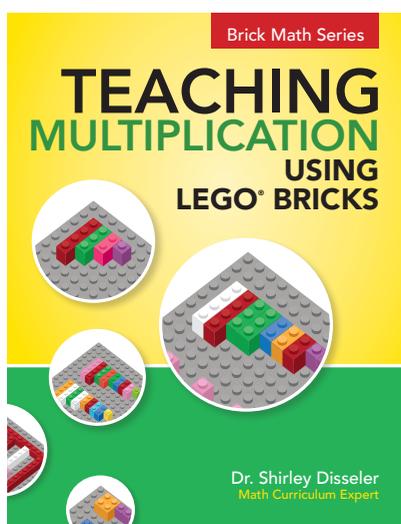
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## PRAISE FOR THE BRICK MATH SERIES: TEACHING MATH USING LEGO® BRICKS

“I finally know what a fraction is. I can *see* it!”

—Student

“Why doesn’t everyone learn math this way?”

—Student

“As an elementary teacher, exploring varying methods of learning is always necessary. From the very first activity in *Teaching Multiplication Using LEGO® Bricks*, it is clear that this book is extremely useful for any student learning (or struggling with) multiplication. For example, when learning/discussing fact families, I have witnessed many students blindly memorizing the facts without truly understanding *why* there is a relationship between the facts. By using different sizes of LEGO® bricks in one of the activities in this book, students are able to build and then observe a visual representation of the fact families. The students are able to see that one 1x6 brick contains the same number of studs as two 1x3 bricks.

In my experience as an educator, students tend to deeply grasp a concept whenever they are fully immersed in the learning process. The activities in this book require students to think critically about the process of multiplication that so often becomes robotic. *Teaching Multiplication Using LEGO® Bricks* covers multiplication processes such as: bundling, repeated addition, using place value, using array models, one-to-one correspondence, and more. Rather than blindly following a set of steps, students are able to build and think critically about what is happening as the problem evolves.

This book is a must-have for any educators exploring multiplication!”

—Elementary Teacher

“As an instructional coach at an elementary school, I have been searching for a teacher-friendly text that emphasizes the educational aspects of LEGO® bricks. *Teaching Multiplication Using LEGO® Bricks* helps breathe life back into mathematics, particularly multiplication instruction. The progression from basic multiplication principles to two- and three-digit multiplication problems is seamless. The students’ understanding of these concepts is reinforced when using the LEGO® bricks, and the text encourages students to explain their findings. I recommend *Teaching Multiplication Using LEGO® Bricks* to everyone in education who wants to take the next step in hands-on learning.”

— Kelli Coons, Instructional Coach

“*Teaching Fractions Using LEGO® Bricks* is a great resource for children to learn about fractions with conceptual understanding and modeling. It’s hands-on, engaging, and overall an exciting way to learn about fractions. When you bring LEGO® bricks into the classroom the students automatically react with “ooh, cool!” and they are hooked on the activity. There is nothing better as a teacher than seeing your students enjoy learning, and using this resource, I see that. Another great feature about this resource is that it utilizes various learning modalities. Students learn physically by manipulating the LEGO® bricks, they draw the models for a visual reference, they write and describe concepts for a verbal understanding, and they are able to reason about the models and concepts to have a comprehensive understanding of fractions. Overall, this resource is phenomenal, and students are sure to be excited about math and fractions!”

—Tina Lupton, Teacher

“The visual models in *Teaching Fractions Using LEGO® Bricks* helped my students see and understand how equivalent fractions really work. The activities are super easy to follow and make learning operations with fractions fun for both the students and the teacher!”

— Jamie Piatt, Fifth Grade Teacher

## *Teaching Division Using LEGO® Bricks*

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