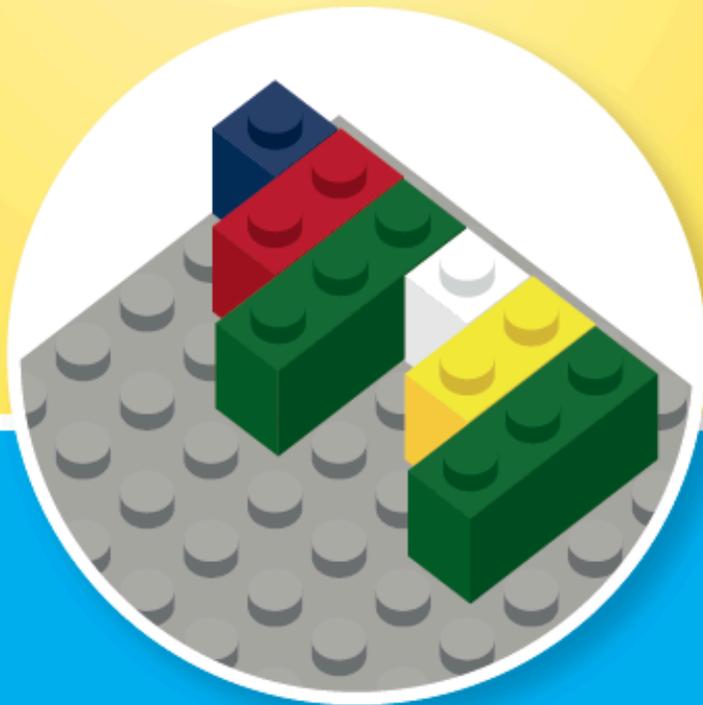
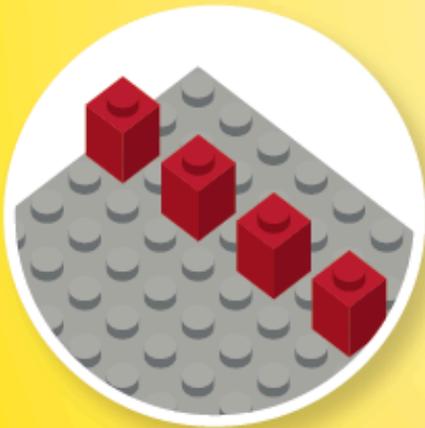


Brick Math Series

TEACHING COUNTING AND CARDINALITY

USING LEGO® BRICKS



Dr. Shirley Disseler
Math Curriculum Expert

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SQUARE NUMBERS

Students will learn/discover:

- How to use a variety of bricks to model numbers up to 20
- What a square number looks like in a model

Why is this important?

This lesson will help students develop number sense as they begin to understand vocabulary required for later mathematical number skills. Students at this stage are not yet learning what it means to say a number is squared. Rather, recognizing a model of a square number versus a non-square number creates discussion around patterns, models of numbers, and lays the groundwork for advanced numerical vocabulary. These skills help students find meaning in addition and multiplication.

Vocabulary:

- Modeling
- More than
- Less than
- Same
- Square number pattern
- Compare

How to use the companion student book, *Learning Counting and Cardinality with LEGO® Bricks*:

- After students build their models, have them draw the models and explain their thinking in the student book. Recording the models on paper after building them with bricks helps reinforce the concepts being taught.
- Discuss the vocabulary for each lesson with students as they work through the student book
- Use the assessment in the student book to gauge student understanding of the content.

SUGGESTED BRICKS

Size	Number
1x1	20
1x2	10
1x3	8
1x4	8
2x2	8
2x3	4
2x4	2

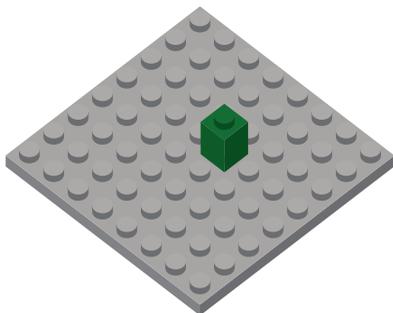
Note: Using a baseplate will help keep the bricks in a uniform line. One large baseplate is suggested for these activities.



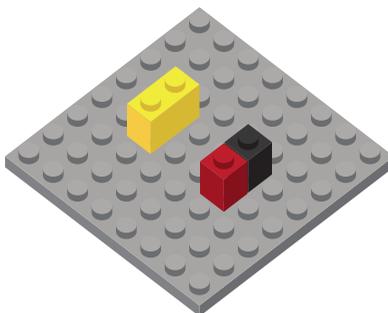
Part 1: Show Them How

1. Using bricks, build models of various numbers up to 10. Show models to the students. The models demonstrate various ways students might think about the numbers.

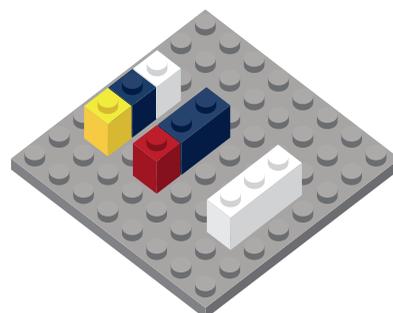
Examples of models include:



The number 1 built with one 1x1 brick

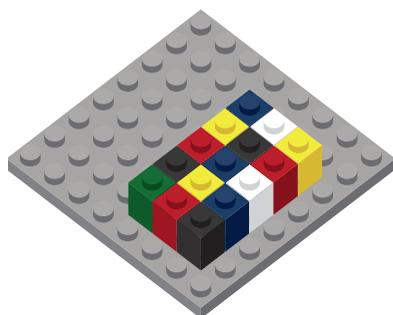


The number 2 built two different ways: one 1x2 brick and two 1x1 bricks



The number 3 built three different ways: three 1x1 bricks, one 1x2 and one 1x1 brick, and one 1x3 brick.

2. Review with students how to count studs using one-to-one correspondence. Tell students that they will be using this idea to model larger numbers and compare size. *Note:* This will lead to a later understanding of square numbers and multiplication.



3. Build a model of the number 15 using 1x1 bricks (3 across and 5 down) and show it to the students. Ask students to build the model.
4. Ask students to describe the shape they see in the model. Students should answer: A rectangle with the top and bottom shorter in length than the left and right sides.

Ask students which bricks were used to make 15 in this model. Students should answer: Fifteen 1x1 bricks.

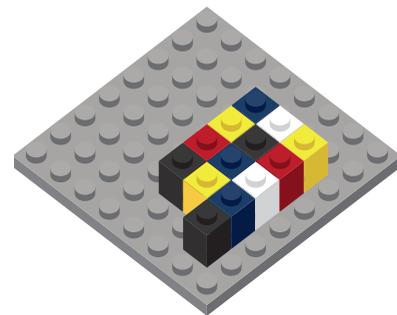


5. Ask students to rearrange the 1x1 bricks on their base plate to build another model of 15 that looks different than the last model of 15. Ask students to draw their model and describe it.

Ask students how this model is like the previous one and how it is different from that model. Students' models can vary widely from the previous model. If they build a rectangle with a horizontal orientation, they will describe it as opposite from the vertical one. If students build an irregular shape with the 15 bricks, they will describe it by side lengths.

6. Ask students to build a model of the number 13 using 1x1 bricks. Ask students to describe how this model is different from the model of 15 that they built. Have students draw their models.

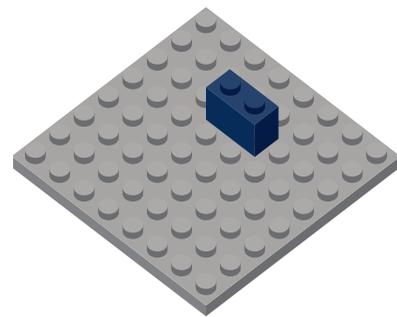
Students should discuss leftover bricks. They should see that you can not make a rectangle with this number because it is prime. *Note:* Students are not able to express the idea of prime and composite yet, but this activity will lead to that theoretical understanding later.



Possible model

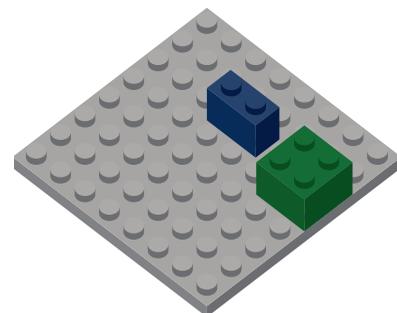
7. Have students build a model of 2 using one 1x2 brick. Walk around and check student models to see how they are approaching this task and to make sure they are using the correct brick. Build a model or have a student show one that he/she has built.

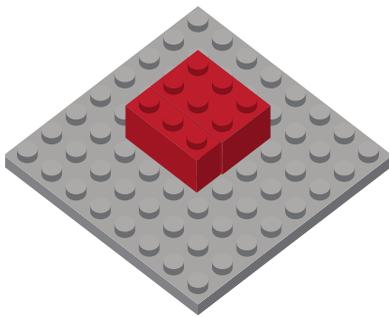
Ask students to describe the shape they see. Students should say that the shape is a rectangle.



8. Ask students to build another model by taking two more 1x2 bricks and placing them together on the base plate. Ask students what number this represents. Students should answer: the number 4.

Ask students to compare this model to the 1x2 brick that models the number 2. Students should answer that this model has two more studs, or note that it looks like a square. Have students draw the model and write a description.





9. Tell students they are going to build another model that forms a square. Ask students to build a model of 9 using three 1x3 bricks. Walk around and investigate how students are approaching this task. Ask students questions individually to guide them, such as:

- How are you thinking about the number 9?
- Is 9 an odd number or an even number?
- Are there any ways to model 9 other than what you have created?

Ask students how this model is like the model for 4 that they built. Students should answer that this model is also in the shape of a square.

Have students draw their models and write a description.



Part 2: Show What You Know

1. Using 1x4 bricks, can you build a model showing 12 studs? Draw your model.

How many bricks did you use? Write a description of your model. Is your model a square or a rectangle?

Answer: It takes three 1x4 bricks to model 12 in the shape of a rectangle.

2. Using 1x1 bricks, can you build a model of the number 17? Draw your model. Compare your model with a partner. Discuss how the models are alike and different. What do you notice about both your model and your partner's model? Write a description of your model.

Answer: Models will vary, but students should recognize that no model of 17 can be a square and that there are leftover bricks.

3. Can you build a model of another square number? Choose a number other than 4 or 9. Draw your model. Explain why it is a square number.

Answers will vary.

4. Choose a number greater than 10. Build a model of your number using bricks. Then:
 - Find someone who has the *same* number model as you.
 - Find someone who built a model that shows a number *greater than* yours.
 - Find someone who built a model that shows a number *less than* yours.

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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