# Hands-On Standards®, Common Core Edition

## Grade 3

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hands-on learning for growing minds

**Hands-On Standards®, Common Core Edition**
**Grade 3**

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# Contents

# Introduction

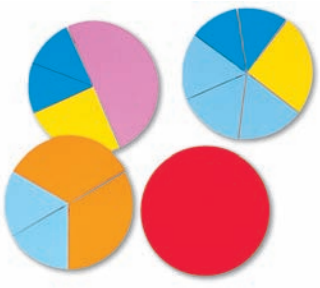
How do we help students find meaning in mathematics? That is, how do we give students more than a rote script for reciting facts and churning out computations? How do we help students develop understanding?

***Hands-On Standards®, Common Core Edition Grade 3*** is an easy-to-use reference manual for teachers who want to help students discover meaning in mathematics. Each of the manual's 40 lessons demonstrates a hands-on exploration using manipulatives. The goal is to help students get a physical sense of a problem—to help students get their hands on the concepts they need to know and to help them "see" the meaning.

Each lesson in ***Hands-On Standards*** targets a clearly stated objective. The main part of a lesson offers a story problem that students can relate to and has the students work on the problem using a hands-on approach. Full-color photographs demonstrate the suggested steps. In addition to the main activity, each lesson includes suggested points of discussion, ideas for more exploration, a formative assessment item, and practice pages to help students solidify their understanding. The instructional model is a progression from concrete to abstract.

This book is divided into five sections—Operations and Algebraic Thinking, Number and Operations in Base Ten, Number and Operations—Fractions, Measurement and Data, and Geometry. These correspond to the five content domains for Grade 3 as cited in the ***Common Core State Standards for Mathematics***.

Each lesson in this book uses one or more of the following manipulatives:
**Deluxe Rainbow Fraction® Circles • Base Ten Blocks • Centimeter Cubes • Color Tiles • Time Interval Rods and Work Mat • Fraction Tower® Cubes • Fraction Number Line • Geoboard • Three Bear Family® Counters • Pattern Blocks • Two-Color Counters • Write-On/Wipe-Off Student Clocks**



Read on to find out how ***Hands-On Standards, Common Core Edition Grade 3*** can help the students in your class find meaning in math and build a foundation for future math success!

# A Walk Through a Lesson

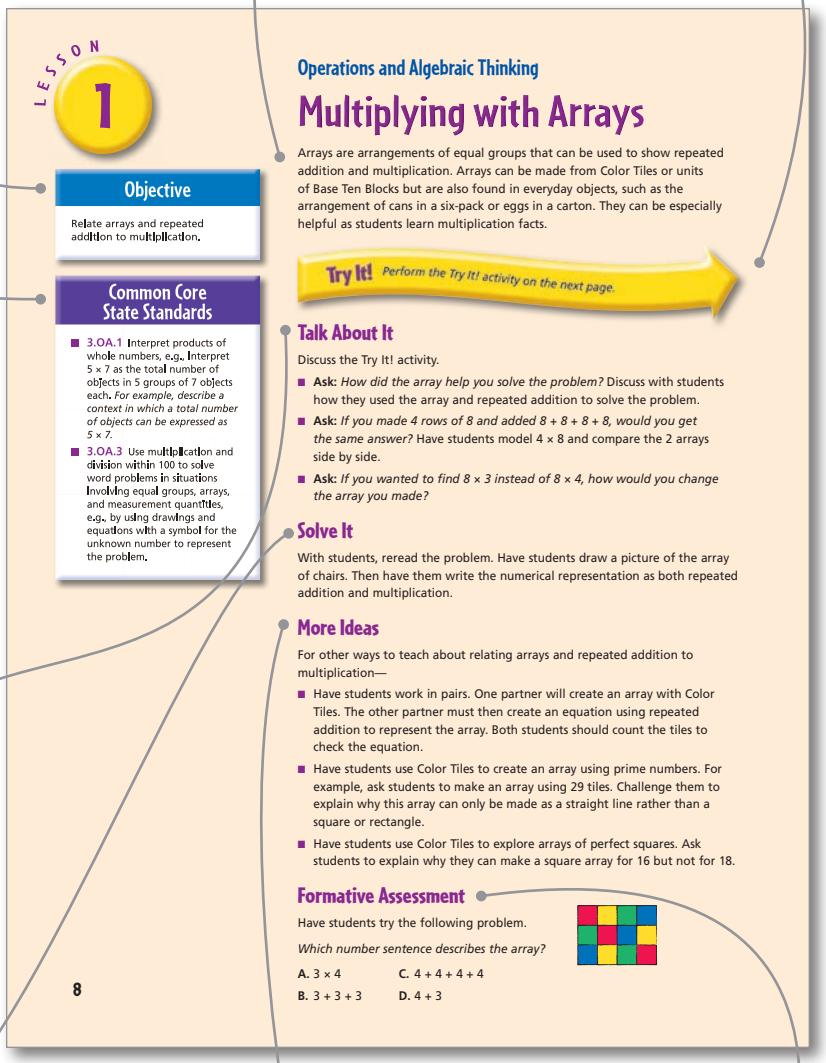
Each lesson in ***Hands-On Standards*** includes many features, including background information, objectives, pacing and grouping suggestions, discussion questions, and ideas for further activities, all in addition to the step-by-step, hands-on activity instruction. Take a walk through a lesson to see an explanation of each feature.

### Lesson Introduction

A brief introduction explores the background of the concepts and skills covered in each lesson. It shows how they fit into the larger context of students' mathematical development.

### Try It! Arrow

In order to provide a transition from the introduction to the activity, an arrow draws attention to the Try It! activity on the next page. When the activity has been completed, return to the first page to complete the lesson.



LESSON 1

Operations and Algebraic Thinking

## Multiplying with Arrays

Arrays are arrangements of equal groups that can be used to show repeated addition and multiplication. Arrays can be made from Color Tiles or units of Base Ten Blocks but are also found in everyday objects, such as the arrangement of cans in a six-pack or eggs in a carton. They can be especially helpful as students learn multiplication facts.

**Objective**

Relate arrays and repeated addition to multiplication.

**Common Core State Standards**

- 3.OA.1 Interpret products of whole numbers, e.g., Interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.*
- 3.OA.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

**Try It!** *Perform the Try It! activity on the next page.*

**Talk About It**

Discuss the Try It! activity.

- **Ask:** *How did the array help you solve the problem?* Discuss with students how they used the array and repeated addition to solve the problem.
- **Ask:** *If you made 4 rows of 8 and added 8 + 8 + 8 + 8, would you get the same answer?* Have students model 4 × 8 and compare the 2 arrays side by side.
- **Ask:** *If you wanted to find 8 × 3 instead of 8 × 4, how would you change the array you made?*

**Solve It**

With students, reread the problem. Have students draw a picture of the array of chairs. Then have them write the numerical representation as both repeated addition and multiplication.

**More Ideas**

For other ways to teach about relating arrays and repeated addition to multiplication—

- Have students work in pairs. One partner will create an array with Color Tiles. The other partner must then create an equation using repeated addition to represent the array. Both students should count the tiles to check the equation.
- Have students use Color Tiles to create an array using prime numbers. For example, ask students to make an array using 29 tiles. Challenge them to explain why this array can only be made as a straight line rather than a square or rectangle.
- Have students use Color Tiles to explore arrays of perfect squares. Ask students to explain why they can make a square array for 16 but not for 18.

**Formative Assessment**

Have students try the following problem.

*Which number sentence describes the array?*

A. 3 × 4 C. 4 + 4 + 4 + 4

B. 3 + 3 + 3 D. 4 + 3

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### Objective

The **Objective** summarizes the skill or concept students will learn through the hands-on lesson.

### Common Core State Standards

Each lesson has been created to align with one or more of the **Common Core State Standards for Mathematics**.

### Talk About It

The **Talk About It** section provides post-activity discussion topics and questions. Discussion reinforces activity concepts and provides the opportunity to make sure students have learned and understood the concepts and skills.

### Solve It

**Solve It** gives students a chance to show what they've learned. Students are asked to return to and solve the original word problem. They might summarize the lesson concept through drawing or writing, or extend the skill through a new variation on the problem.

### More Ideas

**More Ideas** provides additional activities and suggestions for teaching about the lesson concept using a variety of manipulatives. These ideas might be suggestions for additional practice with the skill or an extension of the lesson.

### Formative Assessment

**Formative assessments** allow for on-going feedback on students' understanding of the concept.

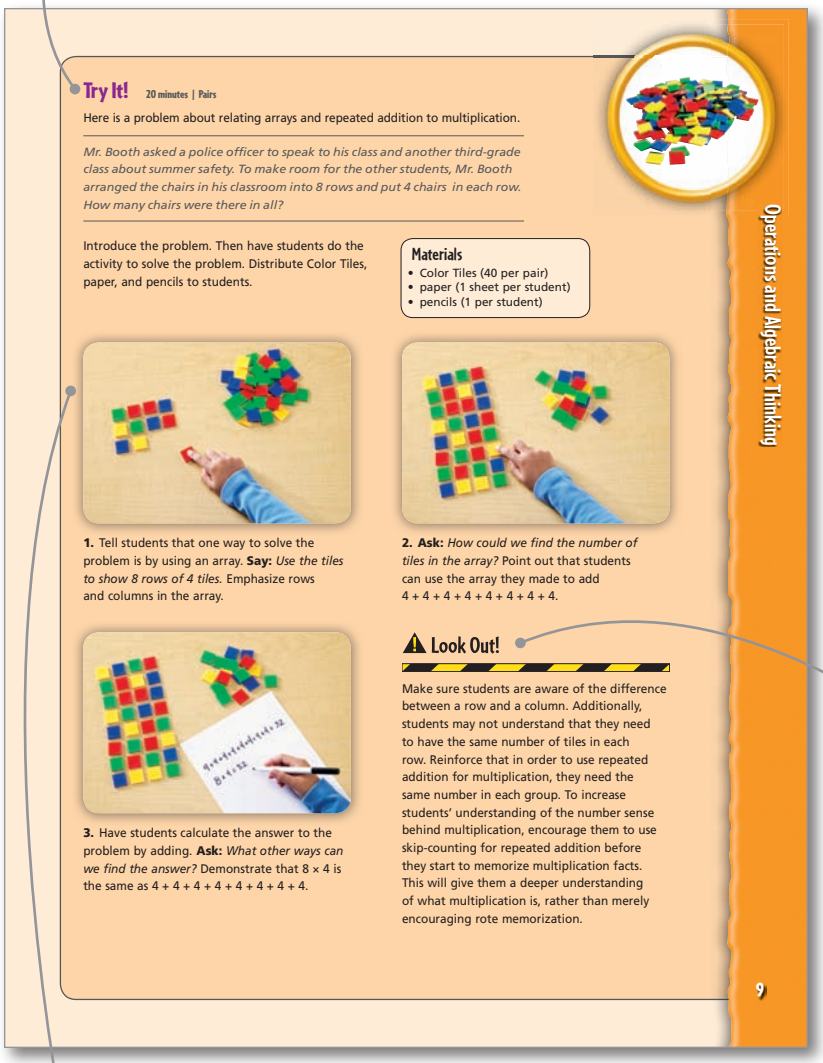
## Try It!

The **Try It!** activity opens with **Pacing** and **Grouping** guides. The **Pacing** guide indicates about how much time it will take for students to complete the activity, including the post-activity discussion. The **Grouping** guide recommends whether students should work independently, in pairs, or in small groups.

Next, the **Try It!** activity is introduced with a real-world story problem. Students will "solve" the problem by performing the hands-on activity. The word problem provides a context for the hands-on work and the lesson skill.

The **Materials** box lists the type and quantity of materials that students will use to complete the activity, including manipulatives such as Color Tiles and Pattern Blocks.

This section of the page also includes any instruction that students may benefit from before starting the activity, such as a review of foundational mathematical concepts or an introduction to new ones.



**Try It!** 20 minutes | Pairs

Here is a problem about relating arrays and repeated addition to multiplication.

*Mr. Booth asked a police officer to speak to his class and another third-grade class about summer safety. To make room for the other students, Mr. Booth arranged the chairs in his classroom into 8 rows and put 4 chairs in each row. How many chairs were there in all?*

Introduce the problem. Then have students do the activity to solve the problem. Distribute Color Tiles, paper, and pencils to students.

Materials
- Color Tiles (40 per pair)
- paper (1 sheet per student)
- pencils (1 per student)

**1.** Tell students that one way to solve the problem is by using an array. **Say:** *Use the tiles to show 8 rows of 4 tiles.* Emphasize rows and columns in the array.

**2. Ask:** *How could we find the number of tiles in the array?* Point out that students can use the array they made to add 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4.

**3.** Have students calculate the answer to the problem by adding. **Ask:** *What other ways can we find the answer?* Demonstrate that 8 × 4 is the same as 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4.

**Look Out!**

Make sure students are aware of the difference between a row and a column. Additionally, students may not understand that they need to have the same number of tiles in each row. Reinforce that in order to use repeated addition for multiplication, they need the same number in each group. To increase students' understanding of the number sense behind multiplication, encourage them to use skip-counting for repeated addition before they start to memorize multiplication facts. This will give them a deeper understanding of what multiplication is, rather than merely encouraging rote memorization.

Operations and Algebraic Thinking

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## Look Out!

**Look Out!** describes common errors or misconceptions likely to be exhibited by students at this age dealing with each skill or concept and offers troubleshooting suggestions.

## Step-by-Step Activity Procedure

The hands-on activity itself is the core of each lesson. It is presented in three—or sometimes four—steps, each of which includes instruction in how students should use manipulatives and other materials to address the introductory word problem and master the lesson's skill or concept. An accompanying photograph illustrates each step.

# A Walk Through a Student Page

Each lesson is followed by a corresponding set of student pages. These pages take the student from the concrete to the abstract, completing the instructional cycle. Students begin by using manipulatives, move to creating visual representations, and then complete the cycle by working with abstract mathematical symbols.

### Exercise

**Concrete** and **Representational** exercises (pictorial representations of the featured manipulative) help students bridge conceptual learning to symbolic mathematics.

### Standards-Based Math Practice

**Abstract** exercises provide standards-based math practice to allow students to deepen their understanding of the featured skill.

Lesson 1 Operations and Algebraic Thinking

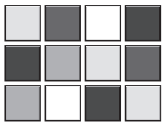
*Answer Key*

**Use Color Tiles to build each array.**
**Write the multiplication sentence for each array.** (Check students' work.)

1. 

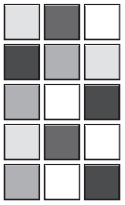
2 rows of 5 tiles

2 × 5 = 10

2. 

3 rows of 4 tiles

3 × 4 = 12

3. 

5 rows of 3 tiles

5 × 3 = 15

**Build each array using Color Tiles. Then sketch the model below.**
**Write each multiplication sentence.** (Check students' models.)

4. 2 rows of 9 tiles

2 × 9 = 18

5. 7 rows of 4 tiles

7 × 4 = 28

6. 5 rows of 6 tiles

5 × 6 = 30

**Find the answer to each multiplication problem.**

7. 8 × 5 = 40
8. 2 × 7 = 14
9. 4 × 4 = 16
10. 6 × 3 = 18
11. 3 × 5 = 15
12. 7 × 6 = 42





Download student pages at hand2mind.com/hosstudent.

## Extended Response

Extended Response exercises feature an open-ended constructed response question to help teachers gauge student understanding.

*Answer Key*

**Challenge!** Which two problems from the previous page can be used to demonstrate the Commutative Property of Multiplication? Model the arrays that show both multiplication expressions.

Challenge: (Sample) Problems 3 and 11; Both have factors of 3 and 5. In Problem 3, there are 5 rows of 3 tiles for a total of 15 tiles. The multiplication sentence is 5 × 3 = 15. In Problem 11, the array is 3 rows of 5 tiles for a total of 15 tiles. The multiplication sentence is 3 × 5 = 15. These arrays show that the order of the factors does not change the product.

## Answers for the Teacher

Answers are provided for teachers on the included student pages.

## Student Pages Download

Download clean copies of the student pages by visiting the URL listed.