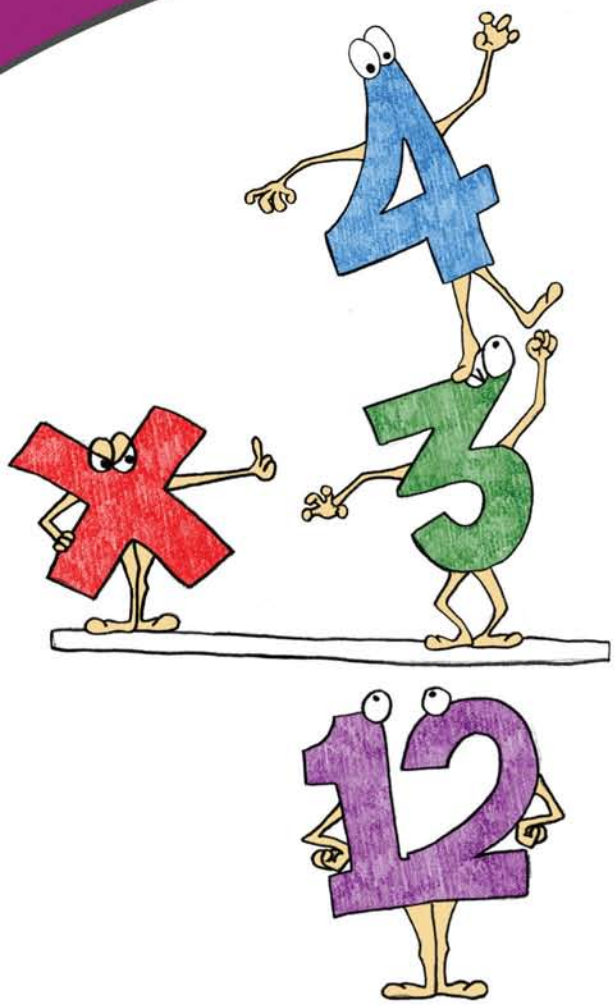
Grades 3-5

LAURA CANDLER'S

MASTERING MATH FACTS

MULTIPLICATION & DIVISION

ALIGNED WITH THE COMMON CORE



INCLUDES

- Step-by-step lessons to teach multiplication and division concepts
- Complete motivational program to ensure ALL students learn math facts
- Aligned with Common Core Standards for Math Content and Practice
- Ready-to-use math center games

FIELD TESTED TEACHER APPROVED FIELD TESTED

Mastering Math Facts

Multiplication and Division: Aligned with the Common Core

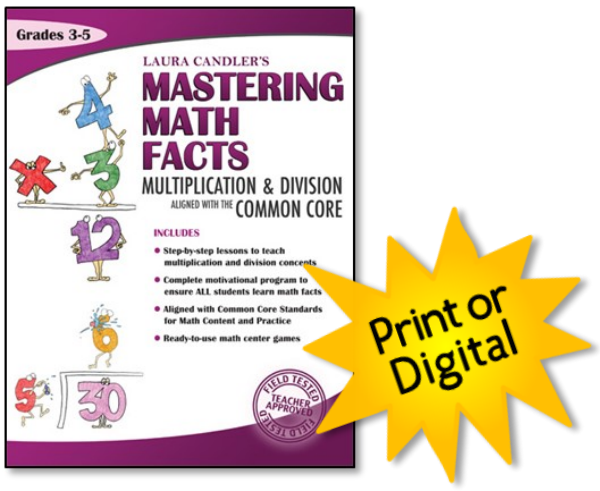
Preview and Sampler

I hope you enjoy this free 45-page sample of **Mastering Math Facts Multiplication and Division: Aligned with the Common Core**. This preview includes the Introduction, Table of Contents, Common Core charts, the **Show What You Know** assessment, and two complete activities to use with your students. **Fishbowl Multiplication** is a teacher-guided lesson for teaching basic multiplication concepts, and **In the Dog House** is a partner practice game. The remaining pages are representative samples from all four chapters.

One exciting feature of the digital version is the blue page number hyperlinks in the Table of Contents and on many other pages. In the full version, you can click these links to jump directly to those pages in the book. Clicking the words **Mastering Math Facts** in each page footer will bring you directly back to the Table of Contents.

Mastering Math Facts Multiplication and Division is available on TpT in both print and digital formats. To learn more about this resource and to read testimonials from teachers who have used it with their students, click over to the Mastering Math Facts page on Teaching Resources. Enjoy the freebies in this sample!

Laura Candler



Praise for
Laura Candler's Mastering Math Facts - Multiplication & Division

I bought *Laura Candler's Mastering Math Facts* just a week ago and my kids are already starting to learn their multiplication facts! They are actually excited every day to take the quiz. So easy to get started in the classroom. Thank you for an awesome product!

—Elaine Laws, Kernersville, North Carolina, third grade teacher

I have used *Mastering Math Facts* with both fourth grade and fifth grade. It doesn't matter how well they know their facts when we start. Everyone will learn them by December. We do the daily drill using white boards and a weekly fact test on Fridays that's random. My special education kids even joined our ice cream party. The kids loved watching their scoops pile up. Absolutely a great resource that I use every year.

—Tisa Fischer, Bakersfield, California, fifth grade teacher

This is a wonderful tool to engage students in mastering their facts without having anyone feel negatively about themselves or their lack of progress in competing against other students. Students work at beating their own goals each time and then encourage each other to attain their class goal for each multiplication fact. It has promoted individual confidence and team work in my class. Thank you for this universal tool.

—Natalie Alaniz, San Antonio, Texas, third grade teacher

My school bought *Mastering Math Facts* for all the teachers. Not only are the games easy to play and for kids to understand, but it aligned perfectly to the third grade Common Core essential standards for North Carolina!

—Dara Platon, Pittsboro, North Carolina, third grade teacher

As a tutor, I see everyday how not knowing your math facts can hold you back from learning new concepts. I gave this program a try and loved the quality work inside. The games have been so much fun and my students request them again and again. It's also saved me mountains of prep time.

—Adrianne Meldrum, Meridian, Idaho, tutor

This was, by far, the easiest way to teach multiplication I've ever used. I found the results to be fantastic, and I will certainly use it again next year. This was the first year that my students learned their multiplication facts to 12 by December! My class got really motivated by the ice cream scoops and resulting ice cream sundae party. But, more than that, they were really proud every time they earned a scoop. The students had nothing but positive comments, with most of them saying, "Now I get it!"

—Sharon Manka, Plumas Lake, California, third grade teacher

Contents

contents

The Need to Master Math Facts

Most classroom teachers would agree that knowing basic math skills is a major factor in strong mathematics progress, and research confirms this view.

Students who know the basic math facts are more likely to experience success in higher-level mathematics education. The Final Report of the National Mathematics Advisory Panel (2008, U.S. Department of Education) repeatedly refers to "the mutually reinforcing benefits of conceptual understanding, procedural fluency, and automatic (i.e. quick and effortless) recall of facts."

The Common Core State Standards for Mathematics emphasize the importance of students not only developing a conceptual understanding of multiplication and division, but also memorizing those math facts. The last sentence in Standard 3.OA.C.7 is: "By the end of Grade 3, *know from memory* all products of two one-digit numbers" (italics mine).

These experts agree that it is critical that our students memorize math facts. But why? Most children have easy access to calculators, and many adults don't remember the times tables. In today's world, why is memorizing math facts so necessary? The answer is fluency. Fluency is just as important to math success as it is to reading. Students who struggle to decode each word will never improve their reading comprehension until they improve their reading fluency. In the same way, students who are counting times tables on their fingers are doomed to fail in mathematics. How can they learn to divide or reduce fractions when all their mental powers are devoted to recalling basic math facts? According to the Common Core Standards, fourth graders not only have to use multiplication and division in word problems, but they must be able to find all the factors of any number from 1 to 100. Finding factors of a number is extremely time-consuming if you have to rely on a calculator—or your fingers—to do the work. The fifth grade Common Core Standard 5.NBT.B.5 states that students must be able to "Fluently multiply multi-digit whole numbers using the standard algorithm." Fluency is key.

When students haven't mastered the basics, they begin to struggle with many other math concepts. They lose confidence in themselves, think they are not smart and, worse, think they will never be good in math. One by one, the doors of future math and science

opportunities begin to close to these students.

One reason many students never successfully master the times tables is that they lack a solid foundation of basic multiplication concepts. Perhaps they were taught through rote memorization without being given the opportunity to explore multiplication concepts with concrete materials. Or maybe they learned the concepts through hands-on exploration but did not spend enough time practicing these skills to develop fluency. Many children are frustrated and bored by lengthy drill and practice worksheets. These students often give up on learning the math facts, particularly if they don't understand *why* they need to master them.

No matter what grade we teach, we have to "own" the problem of poor computational fluency in our students and *insist* that they learn basic math facts. Of course they should have learned the math facts before coming to our classrooms—but it's our responsibility to make sure they learn them before being promoted to the next grade. If they don't have the foundation in place, we have to provide them with opportunities to explore multiplication with hands-on materials. If they need more opportunities to develop fluency, we must engage them in practice activities and multiplication games on a regular basis. We must convince our students of the importance of knowing math facts so they will see math facts mastery as a worthy accomplishment.

Mastering Math Facts is a proven system you can use to help students develop both a deep understanding of basic facts and fluency with them.

Common Core Alignment

Every aspect of *Mastering Math Facts* is aligned with Common Core Math Standards. Chapter 1 consists of eighteen different lessons, each aligned with one or more third grade Content Standards as well as one or more Mathematical Practice standards. Chapters 2, 3, and 4 are all aligned with Content Standard 3.OA.C.7: Fluently multiply and divide within 100. If you teach fourth or fifth grade, you are responsible for making sure students master all math content up to and including your grade. If your students have not met these third grade standards, those standards should be addressed before you can move on to more advanced math concepts appropriate for your grade level.

Using This Book

Mastering Math Facts: Multiplication and Division is primarily for third through fifth grades. A third grade teacher can expect to spend weeks of class time developing basic concepts and should not expect students to become fluent until the end of the year. But fifth grade students have already received instruction in multiplication and division concepts, so they may need only a quick review of the basic concepts. With just 10 or 15 minutes a day of review and practice activities, they can achieve mastery of the concepts and build fluency.

Review the components of the program to decide where you need to begin:

Common Core Connections Chart ● This chart (**pages 4 - 5**) is a quick reference guide that includes all Common Core Standards for math content and mathematical practices that are aligned with specific lessons and activities in the *Mastering Math Facts* program.

Chapter 1 ● Teaching Multiplication and Division for Understanding

Chapter 1 has detailed Common Core-aligned lessons to introduce students to basic multiplication and division concepts. It's critical that students understand what multiplication and division mean before you begin the practice activities. Third grade teachers can expect to spend a lot of time with these hands-on activities. Fourth and fifth grade teachers may want to use the *Multiplication: Show What You Know* assessment first to determine how much time, if any, they need to spend on these activities.

Chapter 2 ● The Mastering Math Facts System

Chapter 2 includes a full explanation of the Mastering Math Facts system, developed and used successfully for more than 10 years to help students achieve fluency with the times tables. If your students already understand multiplication and division concepts, you can begin your instruction with the strategies described in this chapter. These activities are designed to take no more than 10 to 15 minutes a day.

Chapter 3 ● Math Facts Assessment Strategies

Chapter 3 explains how to assess your students' fluency, both with individual math facts as well as when all the math facts are mixed together. You'll learn how to administer Daily Quick Quizzes and other math facts tests.

Chapter 4 ● Math Facts Practice Activities

Chapter 4 includes a variety of math games and activities that can be used in conjunction with the Mastering Math Facts system to help students achieve mastery. These activities can also be used throughout the year to help students maintain fluency with the times tables.

Supplementary Online Resources ● Additional printables that add "extras" to the program are available at (URL removed from sample.) All downloadable resources are noted with this icon:

Decide where you need to begin with your students, and get started. Let's join forces and declare war on computational illiteracy!

Math Content Standards (3rd Grade)	Lessons and Activities
Content.3.OA.A.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each.	Hula-Hoop Multiplication (p. 17) Cookies and Chips (p. 19) Egg Carton Groups (p. 23) Fishbowl Multiplication (p. 26) Do the Math: Multiplication (p. 32) Picture This: Multiplication (p. 34) Object Arrays (p. 41) Linking Cube Arrays (p. 43) Graph Paper Arrays (p. 45) Rectangle Race (p. 48) Multiplication Table Arrays (p. 52)
Content.3.OA.A.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.	Fair Shares Exploration (p. 62) Fishbowl Division (p. 64) Division Mix-up (p. 74) Do the Math: Division (p. 82) Picture This: Division (p. 85)
Content.3.OA.A.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.	Do the Math: Multiplication (p. 32) Picture This: Multiplication (p. 34) Do the Math: Division (p. 82) Picture This: Division (p. 85)
Content.3.OA.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = _ ÷ 3, 6 × 6 = ?	Linking Cube Arrays (p. 43) Fishbowl Division (p. 64) Mystery Multiplication (p. 177)
Content.3.OA.B.5 Apply properties of operations as strategies to multiply and divide. Example: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.)	Linking Cube Arrays (p. 43) Multiplication Table Arrays (p. 52) Math Fact Families (p. 77)
Content.3.OA.B.6 Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.	Fishbowl Division (p. 64)
Content.3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.	Rectangle Race (p. 48) Introducing Math Facts (p. 56) Math Fact Families (p. 77) Mastering Math Facts System – Chapter 2 (p. 97) All assessments in Chapter 3 (p. 139) All math facts practice activities in Chapter 4 (p. 173)

Math Practice Standards (All Grades)	Lessons and Activities
Practice.MP1 Make sense of problems and persevere in solving them.	Do the Math: Multiplication (p. 32) Picture This: Multiplication (p. 34) Do the Math: Division (p. 82) Picture This: Division (p. 85) Mystery Multiplication (p. 177)
Practice.MP4 Model with mathematics.	Hula-Hoop Multiplication (p. 17) Cookies and Chips (p. 19) Egg Carton Groups (p. 23) Fishbowl Multiplication (p. 26) Do the Math: Multiplication (p. 32) Picture This: Multiplication (p. 34) Object Arrays (p. 41) Linking Cube Arrays (p. 43) Graph Paper Arrays (p. 45) Rectangle Race (p. 48) Multiplication Table Arrays (p. 52) Introducing Math Facts (p. 56) Fair Shares Exploration (p. 62) Fishbowl Division (p. 64) Division Mix-up (p. 74) Math Fact Families (p. 77) Do the Math: Division (p. 82) Picture This: Division (p. 85)
Practice.MP5 Use appropriate tools strategically.	Linking Cube Arrays (p. 43) Graph Paper Arrays (p. 45) Multiplication Table Arrays (p. 52) Introducing Math Facts (p. 56) Mystery Multiplication (p. 177)
Practice.MP6 Attend to precision (in mathematical communication).	Hula-Hoop Multiplication (p. 17) Fishbowl Multiplication (p. 26) Object Arrays (p. 41) Linking Cube Arrays (p. 43) Graph Paper Arrays (p. 45) Multiplication Table Arrays (p. 52) Fishbowl Division (p. 64) Division Mix-Up (p. 74) Math Fact Families (p. 77)
Practice.MP7 Look for and make use of structure.	Object Arrays (p. 41) Linking Cube Arrays (p. 43) Graph Paper Arrays (p. 45) Multiplication Table Arrays (p. 52) Introducing Math Facts (p. 56) Math Fact Families (p. 77) Mystery Multiplication (p. 177)

CHAPTER 1

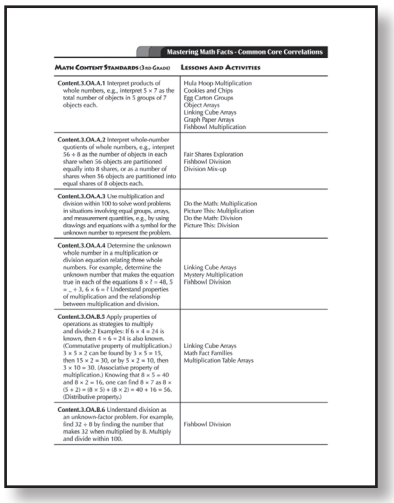
Teaching Multiplication and Division for Understanding

Chapter 1

Teaching Multiplication and Division for Understanding

The first step towards math fact mastery is to build a foundation of understanding by introducing multiplication and division concepts slowly, using a variety of hands-on activities. Introducing these concepts in many different ways encourages students to develop flexibility in their mathematical thinking. By the beginning of third grade, most children can grasp the idea of multiplication as a shortcut for describing groups of things. But students continue to need plenty of opportunities to explore multiplication and division concepts with real objects and drawings to develop a solid foundation.

The Common Core State Standards place development of this foundation in third grade. The Operations and Algebraic Thinking Standards for third grade include seven specific content standards for teaching multiplication and division. The eighteen lessons in this chapter are all correlated to at least one of these Content Standards. These lessons are also aligned with one or more Mathematical Practice Standards for K-12. The Common Core Connections chart (**pages 4 - 5**) shows the lessons that are aligned to each Standard, and the teacher directions for the activities and lessons note the Common Core Standards they address.

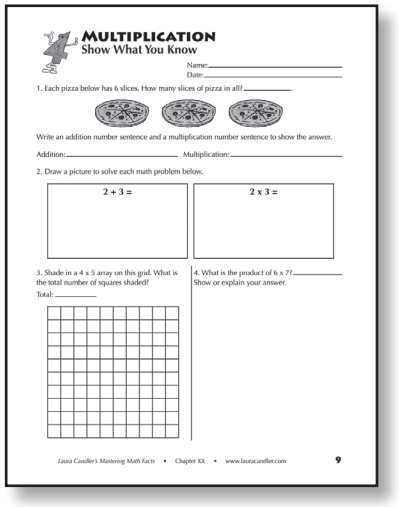


Mastering Math Facts - Common Core Correlations

Math Content Standards (3rd Grade)	Lessons And Activities
Content.3.OA.A.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each.	Hula Hoop Multiplication Cookies and Chips Egg Carton Groups Object Arrays Linking Cube Arrays Graph Paper Arrays Fishbowl Multiplication
Content.3.OA.A.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.	Fair Shares Exploration Fishbowl Division Division Mix-up
Content.3.OA.A.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.	Do the Math: Multiplication Picture This: Multiplication Do the Math: Division Picture This: Division
Content.3.OA.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = _ ÷ 3, 6 × 6 = ? Understand properties of multiplication and the relationship between multiplication and division.	Linking Cube Arrays Mystery Multiplication Fishbowl Division
Content.3.OA.B.5 Apply properties of operations as strategies to multiply and divide 2 Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)	Linking Cube Arrays Math Fact Families Multiplication Table Arrays
Content.3.OA.B.6 Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8. Multiply and divide within 100.	Fishbowl Division

Because many students have not received this type of instruction in the early grades, upper elementary teachers may need to teach multiplication and division concepts. These teachers should assess their students' prior knowledge of multiplication concepts and choose appropriate hands-on activities to build that missing foundation. Requiring students to memorize times tables when they don't understand them is a big mistake. Teachers can begin introducing basic division concepts using manipulatives after students understand multiplication on a conceptual level, even if they have not developed fluency with the math facts.

Assessing Prior Knowledge of Multiplication Concepts


MULTIPLICATION
Show What You Know

Name:
Date:

1. Each pizza below has 6 slices. How many slices of pizza in all? _____

Write an addition number sentence and a multiplication number sentence to show the answer.

Addition: _____ Multiplication: _____

2. Draw a picture to solve each math problem below.

2 + 3 =

2 x 3 =

3. Shade in a 4 x 5 array on this grid. What is the total number of squares shaded?
Total: _____

4. What is the product of 6 x 7? _____
Show or explain your answer.

Laura Candler's Mastering Math Facts • Chapter XX • www.lauracandler.com 9

If you aren't sure what your students already know about multiplication, have each student complete the pretest *Multiplication: Show What You Know* (**page 11**). This is a quick assessment designed to show if students understand the connection between addition and multiplication, and whether or not they are able to model these concepts.

There is a sample student response on **page 12**, but use your own judgment about accepting answers that are slightly different. For example, when students draw a picture to solve the addition and multiplication number sentences for the second problem, they don't have to draw the same object for both illustrations. However, with the addition sentence, their illustrations should clearly show two items in one set and three more items in another set. When illustrating the multiplication problem they might show any of the following: a 3 x 2 array, a 2 x 3 array, two groups of three objects, or three groups of two objects. Due to the commutative property of multiplication, any of these arrangements would be acceptable. However, if they just drew six objects and didn't show any way of grouping the objects, they are probably missing the concept that multiplication means groups.

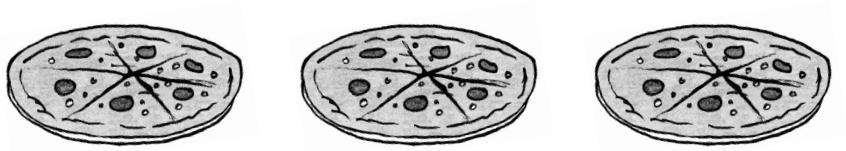
Because this is a formative assessment, there's no need to record a number grade on each students' paper. Simply mark their answers correct or incorrect to help you determine who needs more work with the basic multiplication concepts. If you do want to write a number grade on the assignment, you can count each of the four parts as 25% of the test. This might be helpful if you plan to administer the second form of assessment, *Multiplication: Show What You Know 2* (**page 13**), and want to track their improvement. I do not recommend sending the pretest home to parents or including their percent correct with your other math grades. These grades don't reflect what students have learned in class; they only indicate your students' prior understanding of a concept you have not yet taught.

Multiplication
Show What You Know

Name: _____

Date: _____

1. Each pizza below has 6 slices. How many slices of pizza in all? _____.



Write an addition number sentence and a multiplication number sentence to show the answer.

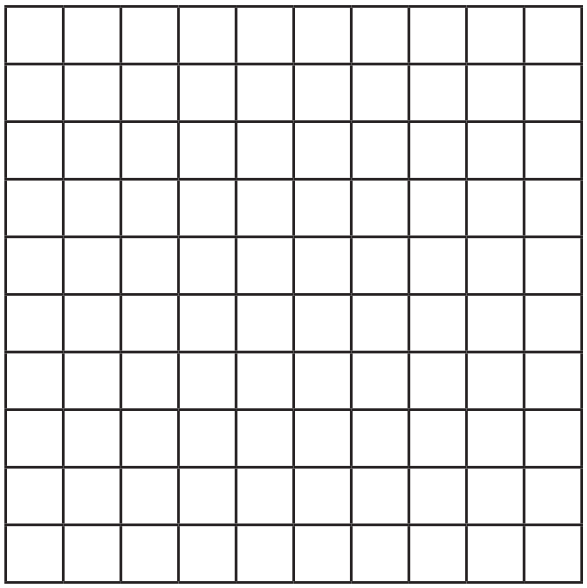
Addition: _____ Multiplication: _____

2. Draw a picture to solve each math problem below.

2 + 3 =	**2 x 3 =**

3. Shade in a 4 x 5 array on this grid. What is the total number of squares shaded?

Total: _____

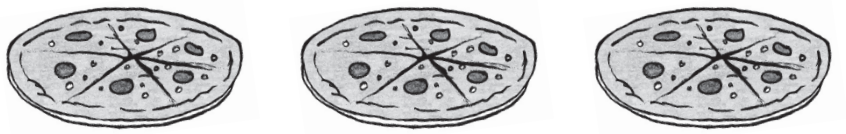


4. What is the product of 6 x 7? _____
Show or explain your answer.

Multiplication
Show What You Know

Answer Key

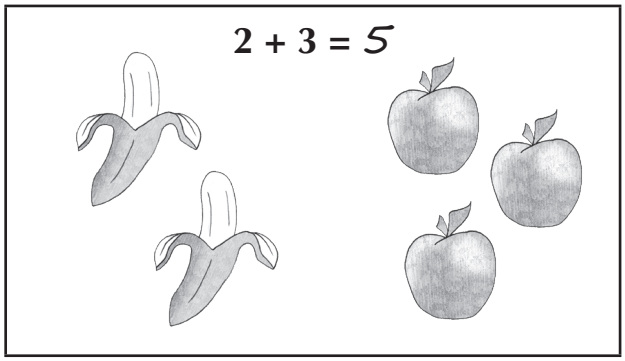
1. Each pizza below has 6 slices. How many slices of pizza in all? 18.

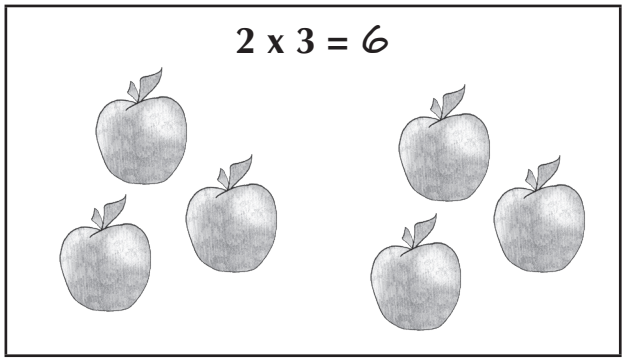


Write an addition number sentence and a multiplication number sentence to show the answer.

Addition: 6 + 6 + 6 = 18 Multiplication: 3 X 6 = 18

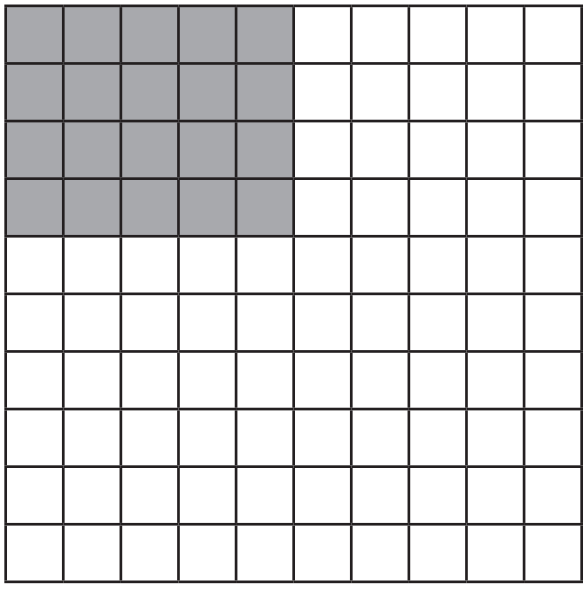
2. Draw a picture to solve each math problem below.



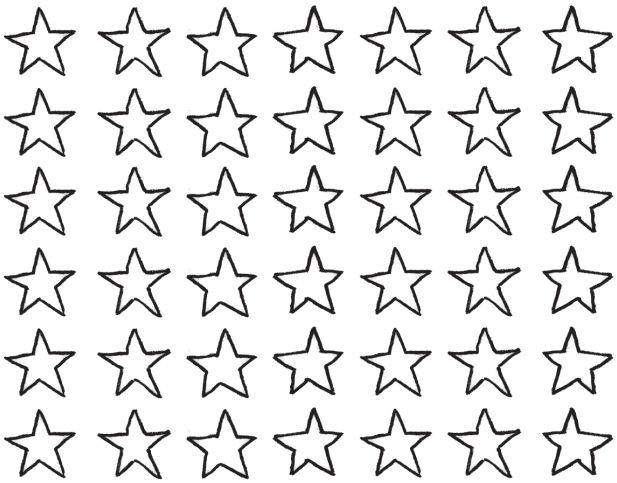


3. Shade in a 4 x 5 array on this grid. What is the total number of squares shaded?

Total: 20



4. What is the product of 6 x 7? 42
Show or explain your answer.



STEP 1 Connect Addition and Multiplication

The most natural way to introduce multiplication is to show students the connection between skip counting in addition and the concept of multiplication as groups of things. These activities will help your students make that transition. The four activities are sequenced in order of difficulty, so be sure to introduce them in this order. You may not need to use all of them—use the pretest results to decide which activities are right for your class.

Each activity is aligned with one or more Common Core Math Content and Practice Standards. The specific Standards covered are noted on the teacher information page for each activity.

Fishbowl Multiplication

Common Core Standards:
3.OA.A.1
MP4, MP6

Fishbowl Multiplication will reinforce the concept of groups. The "fish" in this activity can be any small manipulative—paper clips, plastic chips, or unit cubes. The game does not require students to write down the number sentences, but you can have students do that in a math journal or on dry-erase boards, if you prefer. Begin the activity by modeling it for the whole class, and then let students practice with a partner or in a math center.

Materials

- 1 *Fishbowl Multiplication* game board (**page 29**) for each student pair
- 1 set of *Fishbowl Multiplication* game directions (**page 28**) for each student pair
- Addition and Multiplication Sentence cards (**page 30**) for each student pair
- Small bowl filled with about 30 "fish" (paper clips, plastic chips, or unit cubes for each student pair

Teacher Preparation

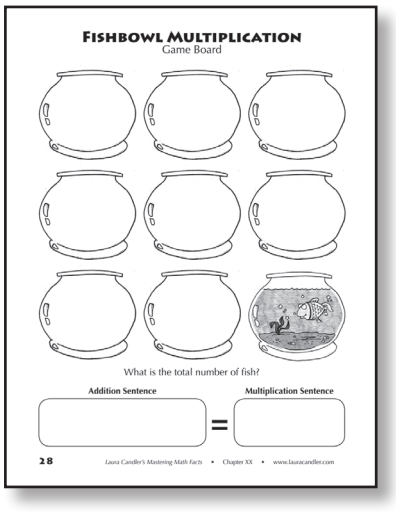
You'll need one bowl for each pair of students. Fill each bowl with about 30 "fish." Copy and laminate 1 *Fishbowl Multiplication* game board (**page 29**) for each pair of students. Copy, laminate, and cut apart the Addition and Multiplication Sentence cards (**page 30**), 1 set for each pair of students. Copy 1 set of *Fishbowl Multiplication* directions (**page 28**) for each pair of students.

Approximate Time:
45 minutes

Whole-Group Lesson Procedure

1 Place the addition sentences face down in a pile. Spread out the multiplication sentences face up on the table. Start with all the fish in the bowl.

2 Choose two students to help you model the game in front of the class using a document camera or overhead projector. Project the game board. Partner A chooses an addition sentence and places it face up in the box at the bottom of the page. He or she fills the "fishbowls" on the game board with equal groups of "fish" according to the card.


FISHBOWL MULTIPLICATION
Game Board
What is the total number of fish?
Addition Sentence
Multiplication Sentence
=
28

3 Partner B finds the matching multiplication sentence and places it face up in the other box. Partner B then counts to find the total number of fish and announces it to Partner A.

4 If Partner A agrees, they remove both cards and set them aside. Put all the fish back in the bowl. If not, recount the fish.

5 Repeat steps 1 - 4, with Partner B choosing the addition sentence and Partner A finding the multiplication sentence.

6 Repeat this one or two more times, making sure the whole class understands the game.

Partner Practice

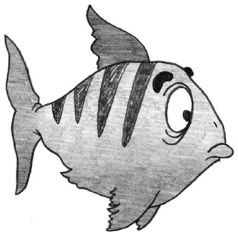
1 Pair students and give each pair a game board, a bowl of manipulatives, and a set of game cards. Display the directions (**page 28**) or give each pair a set of printed directions.

2 Designate who is Partner A and who is Partner B for the first round of the activity and remind them to switch roles for each round. Have them play the game according to the directions.

3 Circulate throughout the room and assist students as needed.

Laura's Tips

After students have played *Fishbowl Multiplication* in this setting, place the game in a math center for them to play later. Glue the directions onto the front of a manila envelope and store all game pieces inside. The envelope can serve as the "fishbowl."



Fishbowl Multiplication

Directions

Number of Players: 2

Materials:

Fishbowl Multiplication game board
Addition and Multiplication Sentences
Bowl with 30 "fish" (paper clips or small objects)

1 Place the Addition Sentences face down in a pile. Spread out the Multiplication Sentences face up on the table.

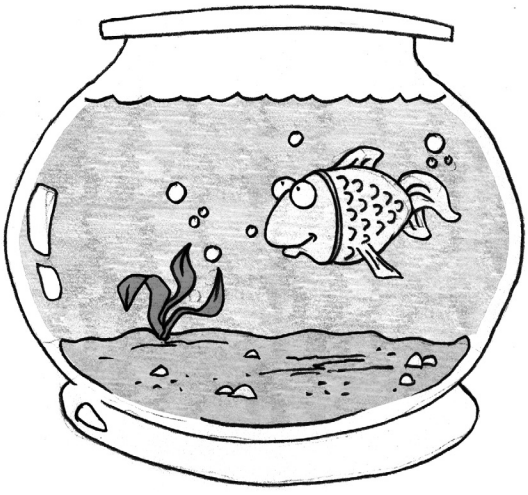
2 Decide who is Partner A and who is Partner B. Partner A chooses an Addition Sentence and places it face up in the box at the bottom of the page. Partner A uses the numbers on the card to fill the fishbowls with equal groups of fish.

3 Partner B finds the matching Multiplication Sentence and places it face up in the other box. Partner B then counts to find the total number of fish and announces it to Partner A.

4 If Partner A agrees, remove both cards and set them aside. Put all the fish back in the bowl. If not, recount the fish.

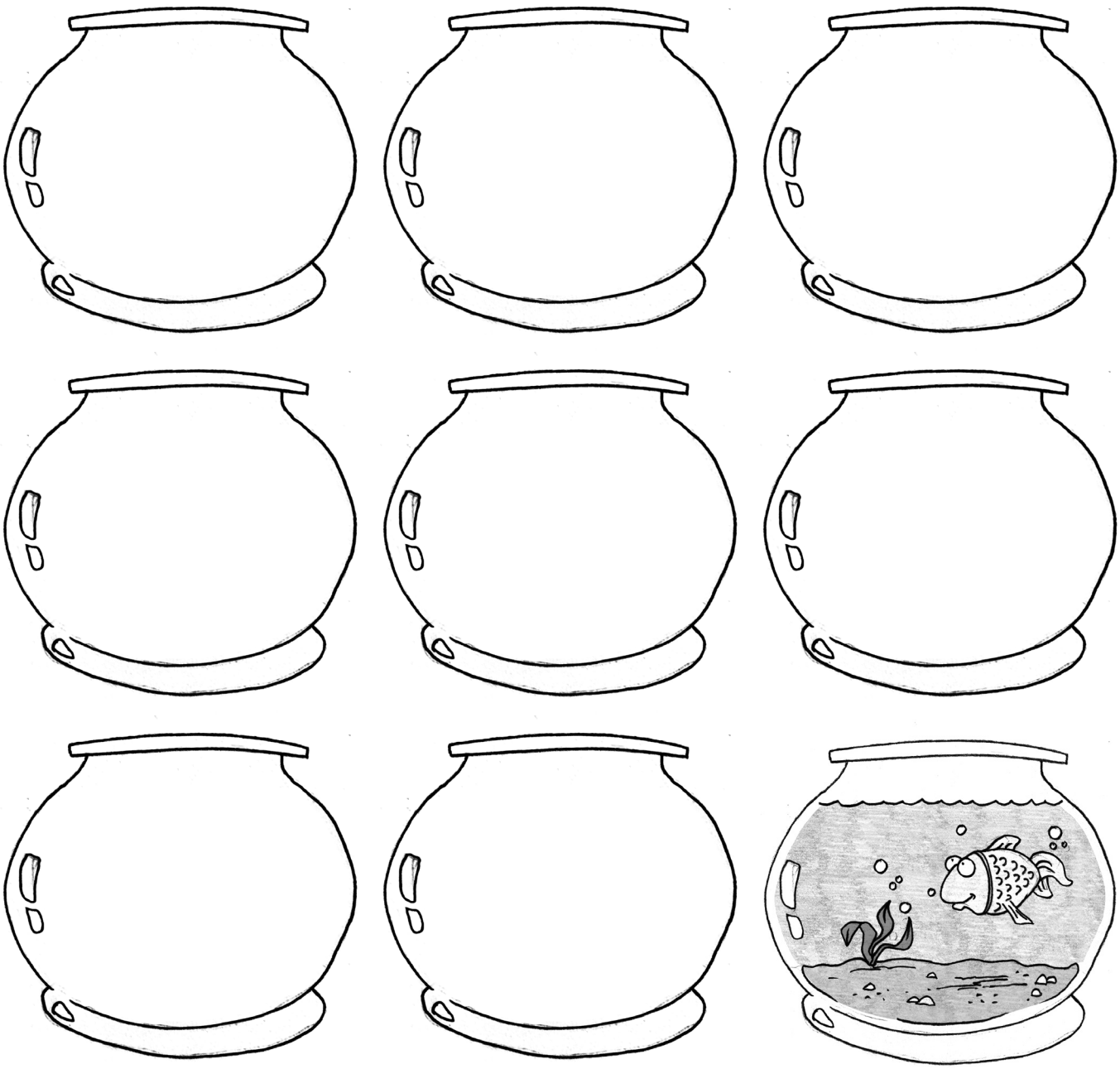
5 Repeat steps 1 - 4, with Partner B choosing the Addition Sentence and Partner A finding the Multiplication Sentence and counting the fish.

6 Continue taking turns until all the cards have been used or the time runs out.



Fishbowl Multiplication

Game Board



What is the total number of fish?

Addition Sentence **Multiplication Sentence**

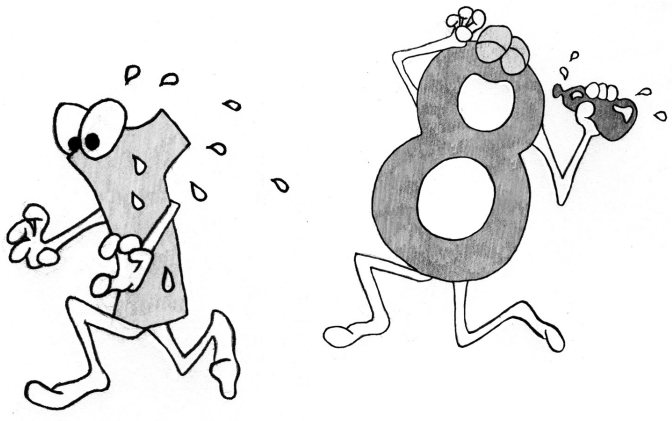
Fishbowl Multiplication

Addition and Multiplication Sentences

3 + 3 + 3 + 3 + 3	5 x 3
7 + 7 + 7	3 x 7
2 + 2 + 2 + 2 + 2	5 x 2
5 + 5 + 5 + 5	4 x 5
8 + 8 + 8	3 x 8
7 + 7 + 7 + 7	4 x 7
4 + 4 + 4 + 4 + 4	5 x 4
9 + 9	2 x 9

CHAPTER 2

The Mastering Math Facts System



CHAPTER 2

The Mastering Math Facts System

Importance of Math Facts Fluency

By now your students recognize the importance of learning the times tables, and they are well on their way to developing a thorough understanding of what multiplication means. However, in order to solve advanced math problems quickly and accurately, students need to learn the times tables **fluently**. If they have to work out every basic math fact with arrays or skip counting, they will never become successful with more advanced math concepts.

The Mastering Math Facts system operates on the assumption that your students understand multiplication and division conceptually and they can apply those concepts to word problems. The system focuses on **developing computational fluency** through a variety of methods to practice times tables, track progress, and motivate students to master the math facts.

Common Core State Standard for Multiplication and Division Fluency (CCSS.Math.Content.3.OA.C.7)

Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

A key component of the Mastering Math Facts system is a motivational program to encourage and reward your students for learning the times tables fluently. I have developed two effective motivational programs, and you can use either one of them or modify them to create your own. Any motivational program you use should energize your students so that they'll be excited about mastering the math facts. Their feelings of accomplishment for learning the times tables will last long after they've enjoyed the reward they earned in your class!

The Mastering Math Facts system is proven to result in all of your students learning

the times tables if the system is implemented according to the recommended guidelines and used consistently for 10 to 15 minutes a day. You are free to modify the components of the program to fit your own needs, but you should be aware that modifying the essential elements too much can give you less than optimal results.

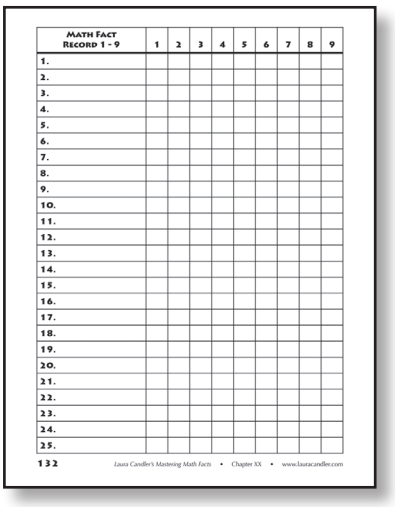
Mastering Math Facts System Step-by-Step

1. Define Math Facts Mastery
2. Evaluate Readiness and Fluency
3. Choose a Motivational Program
4. Introduce the Motivational Program
5. Assess Math Facts Individually
6. Track Progress
7. Practice Mixed Math Facts Daily
8. Monitor Student Progress
9. Recognize Individual Achievement
10. Celebrate Class Success

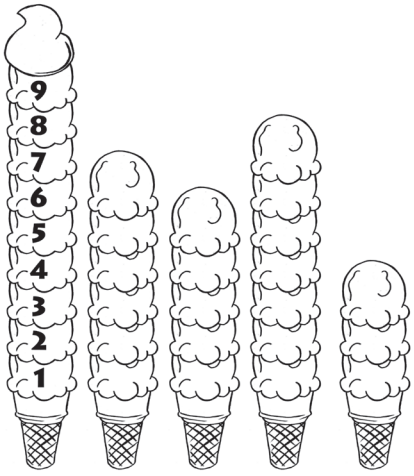
STEP 6 Track Progress

One of the most important elements of the Mastering Math Facts system is how you track student progress. I find three different methods to be helpful: a one-page teacher chart, a wall display, and individual student records for each student. You can determine which methods best meet your needs.

1 Teacher's Master Chart ● This chart serves as your official record of your students' progress. Use a *Math Facts Record* (**page 133** or **134**) as your chart, and choose the version for your class—facts from 1 to 9 or from 2 to 12. Each day after your Daily Quick Quiz session, check off the math facts that your students have mastered. You can download slightly larger versions of these charts at (URL removed from sample.) ONLINE



2 Wall Displays ● In addition to keeping the *Math Facts Record* for your own records, create a classroom wall display that tracks all the students' progress in learning the math facts. Displaying a tracking system often serves to motivate and inspire students to do their best work. There are two different versions of wall displays that you can use:

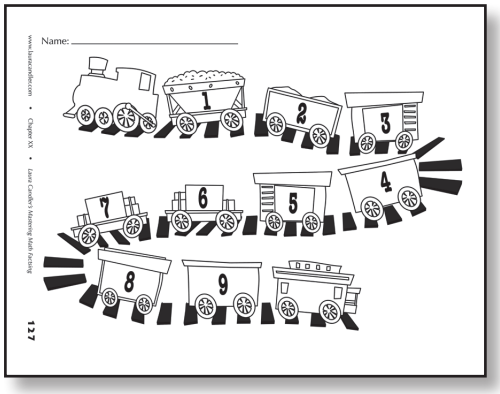


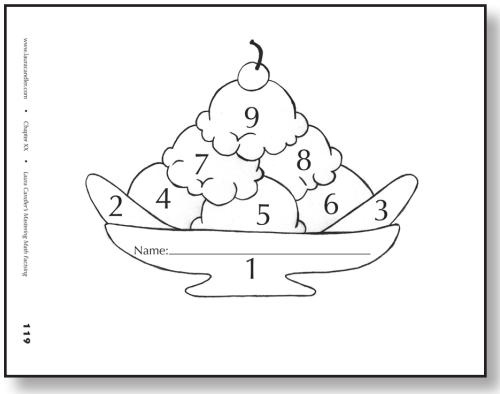
Individual Wall Display ● Each student builds a separate ice cream cone or train on the wall where everyone can see it. Many teachers have reported that this kind of individual display encourages students to cheer each other on and help those who are struggling.

Whole Class Wall Display ● Some teachers prefer not to have displays that highlight individual progress. You can modify the display component

the whole class. Create a large cone or train engine, by enlarging the patterns on **pages 117** and **125**, to about the size of an 8-1/2 x 11-inch sheet of paper. Write the class name on the cone or train engine. Then add one large ice cream scoop or large train car when everyone in the class has mastered that particular math fact.

3 Individual Student Records ● Students also enjoy tracking their progress through their own private recording systems. **Pages 120** and **128** are charts for this purpose, using the ice cream or the train theme. There are variations for each theme for mastering facts from 1 to 9 or 1 to 12. Each student stores the individual chart in a folder. Each day after you complete your Daily Quick Quiz and check off who has mastered which math facts, have your students get out their charts and color in the ice cream scoop or train that represents the math fact they mastered that day.





STEP 7 Practice Mixed Math Facts Daily

It's one thing for students to memorize each set of math facts and write them fluently in a minute or less. But it's quite a different matter to demonstrate fluency when those math facts are mixed together! It happens time and again that a student will successfully build a tall ice cream cone or long train and then be unable to pass a practice test that mixes all the learned math facts together. To prevent this from happening, provide opportunities for students to practice mixed math facts on a regular basis.

Chapter 4 (**page 173**) provides a number of strategies that work well, including:

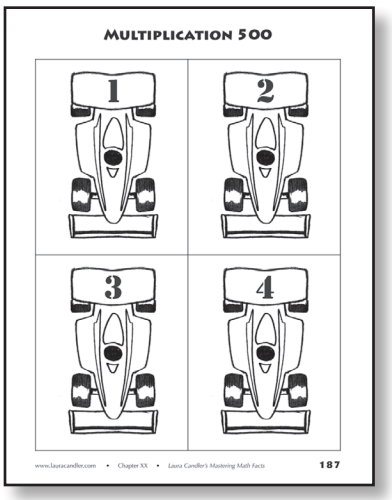
Flash Card Practice (page 174) ● Students can study flash cards on their own or paired with a partner (see directions on **pages 175 - 176**).

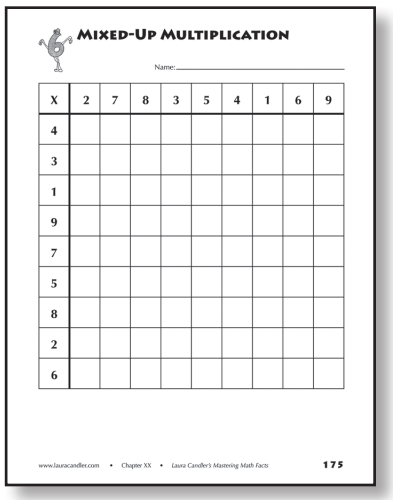
Movement (page 174) ● Many students are kinetic learners, and math facts are a perfect vehicle for matching movement to practice activities!

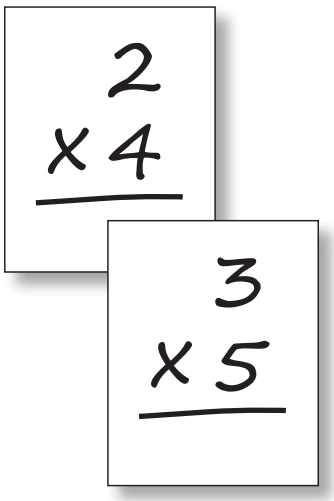
Times Table Challenges (pages 177 - 182) ● Completing variations of the standard times table charts are effective ways to challenge students to practice all the math facts.

Technology (page 183) ● Free online websites, subscription software, and mobile device apps are all great ways to incorporate technology in practicing math facts.

Math Games (page 184) ● Encourage students to play math facts review games after they completed other assignments or in math centers.







Mastering Math Facts System Directions and Printables

Directions and Display materials for "Here's the Scoop on Multiplication" Theme:

Directions and Display materials for "On Board to Multiplication Mastery" Theme:

Forms and printables:

"On Board to Multiplication Mastery" Display Directions

Laura's Tips

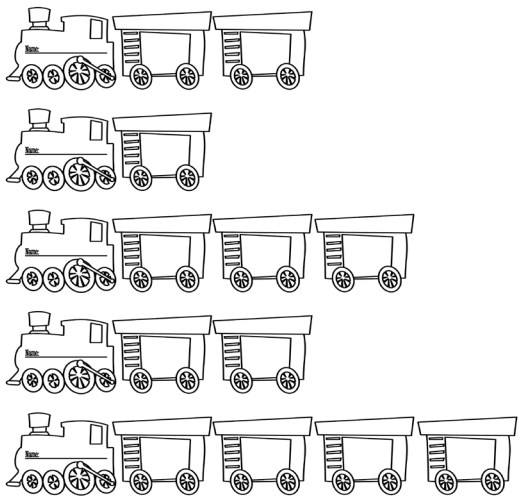
I don't recommend using construction paper because it quickly fades and looks outdated after one year. To find enough colors for your display, you'll probably need to use both bright and pastel colors of card stock.

Materials

- Card stock in a variety of colors
- Train patterns (**pages 125 - 127**)

Individual Student Wall Display

Preparation and Assembly:



1 Using the patterns on **page 125**, cut out one train engine for each student and write his or her name on it.

2 Decide whether you are going to require students to learn math facts to 9 or 12. For each math fact, choose a different color or shade of card stock.

3 Using the pattern on **page 126**, duplicate and laminate enough train cars so that each student will have one of every color.

4 Duplicate and laminate one caboose (**page 127**) for each student.

5 Cut out the train cards and cabooses and store them in labeled plastic zipper bags. Label each bag with the math fact that color represents. (Example: 1s are white, 2s are red, etc.)

6 Place the train engines with student names along the left side of your display area.

CHAPTER 3

Math Facts Assessment Strategies

CHAPTER 3

Math Facts Assessment Strategies

The Mastering Math Facts system includes a key element: a way for teachers to assess math fact fluency. There are two different methods for assessing students' progress as they learn the individual facts—Daily Quick Quizzes and Mini Math Checks. Choose either method that works for you; both have advantages. The Daily Quick Quiz saves paper if you have individual dry-erase boards available in your classroom. Mini Math Checks are easier to implement, but they do require quite a bit of paper.

No matter which method you use, you'll need to keep a progress chart using the Math Facts Record (**page 133** or **134**) and check off math facts as students master them.

After students have mastered the math facts one at a time, use the third type of assessment—mixed math facts tests (**pages 162 - 167**)—to assess students' fluency and accuracy when all the facts are mixed together. Using these assessments will ensure that your students are meeting Common Core Content Standard 3.OA.C.7: Fluently multiply and divide within 100.

- **Daily Quick Quiz (pages 140 - 152)**
- **Mini Math Check (pages 153 - 159)**
- **Mixed Math Facts Assessments (pages 160 - 169)**

Individual Math Facts Assessment 2
Mini Math Check

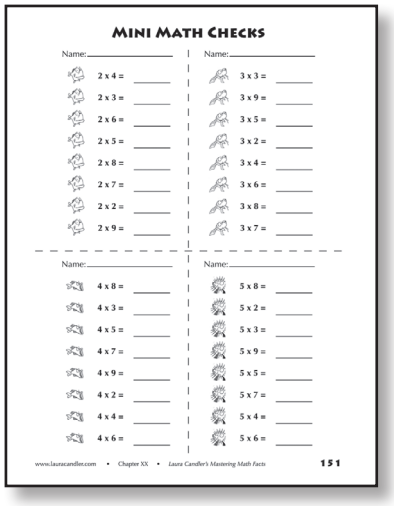
Each Mini Math Check (**pages 154 - 156**) assesses one set of math facts in random order. You can use a Mini Math Check to test the class all at once, or allow students to work with a partner in a math center to test each other.

Materials

- Mini Math Check for each student (**pages 154 - 156**)
- Countdown timer

Procedure

1 Prepare Mini Math Checks ● Duplicate enough Mini Math Checks for your class, cut them apart, and store them in envelopes labeled with the math fact number.


MINI MATH CHECKS

Name: _____ Name: _____

2 x 4 = ____ 3 x 3 = ____
2 x 3 = ____ 3 x 9 = ____
2 x 6 = ____ 3 x 5 = ____
2 x 5 = ____ 3 x 2 = ____
2 x 8 = ____ 3 x 4 = ____
2 x 7 = ____ 3 x 6 = ____
2 x 2 = ____ 3 x 8 = ____
2 x 9 = ____ 3 x 7 = ____

Name: _____ Name: _____

4 x 8 = ____ 5 x 8 = ____
4 x 3 = ____ 5 x 2 = ____
4 x 5 = ____ 5 x 3 = ____
4 x 7 = ____ 5 x 9 = ____
4 x 9 = ____ 5 x 5 = ____
4 x 2 = ____ 5 x 7 = ____
4 x 4 = ____ 5 x 4 = ____
4 x 6 = ____ 5 x 6 = ____

www.lauracandler.com • Chapter XX • Laura Candler's Mastering Math Facts 151

2 Attach Answer Key ● To make the activity self-checking, glue an answer key on the back of the envelope.

3 Set Time Limit ● Give a time limit, such as one minute, for completing the sheet. Determine the time limit based on grade level and students' proficiency.

4 Time Students ● When everyone is ready, call "Start!" Students begin filling in the blanks in order without skipping problems. They must complete all answers in 1 minute or whatever time you have previously announced. Tell them to turn their papers face down when they finish.

5 Trade and Check ● After students complete the Mini Math Check, grade them yourself or let the students correct each other's work using the answer key.

6 Record Progress ● Ask any student who scores a 100% to bring their completed paper to you so you can record the score. Use a Math Facts Record (**page 133** or **134**) and place a check in the column under the math fact they have mastered.

Mini Math Checks

Name: _____

2 x 4 = _____

2 x 3 = _____

2 x 6 = _____

2 x 5 = _____

2 x 8 = _____

2 x 7 = _____

2 x 2 = _____

2 x 9 = _____

Name: _____

3 x 3 = _____

3 x 9 = _____

3 x 5 = _____

3 x 2 = _____

3 x 4 = _____

3 x 6 = _____

3 x 8 = _____

3 x 7 = _____

Name: _____

4 x 8 = _____

4 x 3 = _____

4 x 5 = _____

4 x 7 = _____

4 x 9 = _____

4 x 2 = _____

4 x 4 = _____

4 x 6 = _____

Name: _____

5 x 8 = _____

5 x 2 = _____

5 x 3 = _____

5 x 9 = _____

5 x 5 = _____

5 x 7 = _____

5 x 4 = _____

5 x 6 = _____

Mixed Math Facts Assessments

After students have demonstrated mastery on the individual math facts, it's important to test them on all math facts mixed together. Students cannot be considered fluent with math facts until they know them in any order and anywhere they see them, not just when listed together on a Daily Quick Quiz or Mini Math Check.

Written Assessment Methods

Included in this book are three Mixed Multiplication Facts Tests and answer keys:

- facts from 0 to 5
- facts from 0 to 9
- facts from 0 to 12, with an emphasis on the more difficult math facts

Use the version of the mixed facts test that works best for your class.

Laura's Tips

Younger children may feel overwhelmed to be tested on all facts from 0 to 12 or even 0 to 9 together. I recommend starting with the math facts test of 0 to 5 for this group.

This book includes one Mixed Division Facts Test and its answer key. After students master the multiplication facts, most of them easily learn the division facts from 1 to 9, which are the facts needed for long division.

You can download an additional version of each of the Mixed Facts Tests from the online resources page, (URL removed from sample). ONLINE

The first time you use any of these tests, you may want to eliminate the time limits and simply assign them for homework or independent practice. Later, you can add time limits to help students increase their fluency. The amount of time you set for students to complete each math fact test should be adjusted according to grade level and your own judgment. The following time limits are suggestions; feel free to adapt them as needed.

Multiplication Test 0 to 5 (40 problems)

- Grade 3: four minutes
- Grade 4: three minutes
- Grade 5: two minutes

Multiplication Test 0 to 9 (40 problems)

- Grade 3: five minutes
- Grade 4: four minutes
- Grade 5: three minutes

Multiplication Test 0 to 12 (50 problems)

- Grade 3: seven minutes
- Grade 4: six minutes
- Grade 5: five minutes

Division Test 1 to 9 (40 problems)

- Grade 3: five minutes
- Grade 4: four minutes
- Grade 5: three minutes

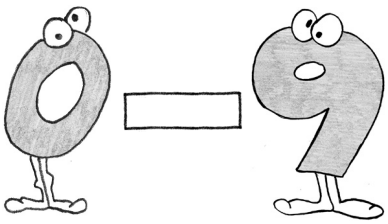
Assessment Using Technology

Technology offers an alternative to written assessment methods. There are many online activities for practicing math facts, but I have found one in particular to be very helpful in assessing knowledge of math facts: Math Fact Café (**www.mathfactcafe.com**). You can have students use Math Fact Café to answer questions for a set of math facts, and then record their score in your Math Facts Record (**pages 133** or **134**). Technology may be especially helpful to assess the math facts knowledge of students with special needs.

Mixed Multiplication Facts Test
0 to 9

Name: _____ Date: _____

1. 7 x 4 ____	**15.** 5 x 6 ____	**29.** 3 x 6 ____
2. 9 x 9 ____	**16.** 3 x 0 ____	**30.** 5 x 5 ____
3. 9 x 7 ____	**17.** 2 x 7 ____	**31.** 9 x 6 ____
4. 4 x 2 ____	**18.** 6 x 4 ____	**32.** 8 x 8 ____
5. 3 x 3 ____	**19.** 8 x 1 ____	**33.** 4 x 9 ____
6. 6 x 7 ____	**20.** 4 x 5 ____	**34.** 3 x 4 ____
7. 0 x 5 ____	**21.** 2 x 6 ____	**35.** 7 x 3 ____
8. 2 x 3 ____	**22.** 3 x 9 ____	**36.** 4 x 4 ____
9. 5 x 2 ____	**23.** 2 x 8 ____	**37.** 5 x 8 ____
10. 6 x 8 ____	**24.** 7 x 8 ____	**38.** 8 x 9 ____
11. 2 x 2 ____	**25.** 3 x 8 ____	**39.** 3 x 5 ____
12. 7 x 7 ____	**26.** 5 x 7 ____	**40.** 7 x 1 ____
13. 2 x 9 ____	**27.** 8 x 4 ____	
14. 6 x 6 ____	**28.** 9 x 5 ____	



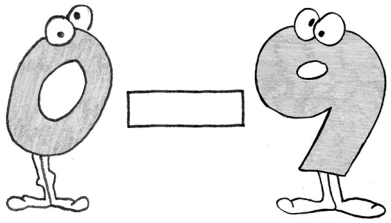
Time _____ **Score** _____

Mixed Multiplication Facts Test

0 to 9

Answer Key

1. 7 x 4	28	**15.** 5 x 6	30	**29.** 3 x 6	18
2. 9 x 9	81	**16.** 3 x 0	0	**30.** 5 x 5	25
3. 9 x 7	63	**17.** 2 x 7	14	**31.** 9 x 6	54
4. 4 x 2	8	**18.** 6 x 4	24	**32.** 8 x 8	64
5. 3 x 3	9	**19.** 8 x 1	8	**33.** 4 x 9	36
6. 6 x 7	42	**20.** 4 x 5	20	**34.** 3 x 4	12
7. 0 x 5	0	**21.** 2 x 6	12	**35.** 7 x 3	21
8. 2 x 3	6	**22.** 3 x 9	27	**36.** 4 x 4	16
9. 5 x 2	10	**23.** 2 x 8	16	**37.** 5 x 8	40
10. 6 x 8	48	**24.** 7 x 8	56	**38.** 8 x 9	72
11. 2 x 2	4	**25.** 3 x 8	24	**39.** 3 x 5	15
12. 7 x 7	49	**26.** 5 x 7	35	**40.** 7 x 1	7
13. 2 x 9	18	**27.** 8 x 4	32		
14. 6 x 6	36	**28.** 9 x 5	45		



CHAPTER 4

Math Facts Practice Activities

CHAPTER 4

Math Facts Practice Activities

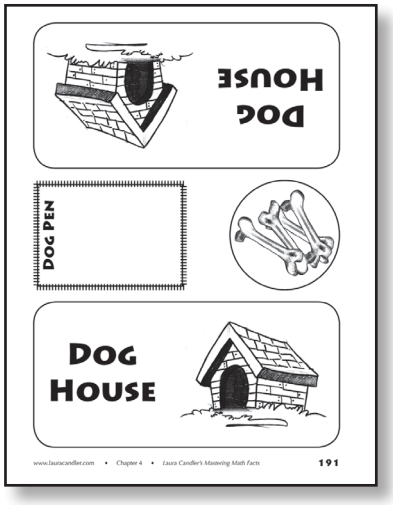
After students understand multiplication and division conceptually, they need a variety of practice methods to increase speed and accuracy. The activities in this section are for use after students have mastered most math facts, to help them commit those facts to memory. They include group movement activities, flash card apps, engaging websites, times table challenges, and hands-on games that students play with a partner or a group. Your students will enjoy these fun activities and will look forward to your math fact practice sessions. Using the practice activities will help you meet Common Core Content Standard 3.OA.C.7: Fluently multiply and divide within 100.

In the Dog House

NUMBER OF PLAYERS: 2

Object of the Game: Win the most dog bones by recalling multiplication facts quickly and accurately

Materials:



- In the Dog House game board
- 20 - 30 "dog bones" (paper clips, dried beans, etc.)
- Deck of playing cards with aces and face cards removed, or 4 sets of number cards (2 - 9)

Directions:

1 Players face each other with the game board between them. Shuffle the cards. Place the deck face down in the Dog Pen in the middle of the board. Pile the dog bones (paper clips, dried beans, or other small items) on the dog bone pile.

2 Each player draws five cards from the Dog Pen. Players may look at their own cards but should not show them to their opponent.

3 To begin play, both players choose two of their own cards to place face down in their own Dog House. After both players have placed their cards, they turn them face up and multiply the numbers on their own two cards. Each player announces his or her product aloud. The player with the greatest product wins and takes a bone from the pile. If a player does not state the product correctly, the other player automatically wins the round.

4 Players remove both of their cards from the game board and set them aside to create a discard pile. Each player draws two new cards from the Dog House so that they each have five cards.

5 Repeat steps 3 and 4 until time is up. If all the cards in the deck are used, shuffle the discard pile and place it back in the Dog Pen.

6 The winner is the player with the most dog bones.

DOG HOUSE

DOG PEN

Dog House

About the Author

Laura Candler is a teacher with 30 years of classroom experience in grades 4 through 6. She has a Master's Degree in Elementary Education, National Board Certification as a Middle Childhood Generalist, and was a Milken Family Foundation Award winner in 2000.

Laura is the author of books and materials that help teachers implement new teaching strategies. Her work bridges the gap between educational theory and practice. Through her materials and her dynamic, interactive workshops, she gives teachers the tools they need to implement teaching strategies immediately.

Laura's materials are "field tested, teacher approved." They have been used by thousands of real teachers in real classrooms all over the world. Laura modifies and adapts her programs based on the experience of those teachers.

For more information and resources, go to Laura Candler's Teaching Resources website at **www.lauracandler.com**.

About Compass Publishing and Brigantine Media

Compass Publishing is the educational book imprint of Brigantine Media. Materials created by real education practitioners are the hallmark of Compass books.

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Laura Candler's

POWER READING WORKSHOP

A STEP-BY-STEP GUIDE

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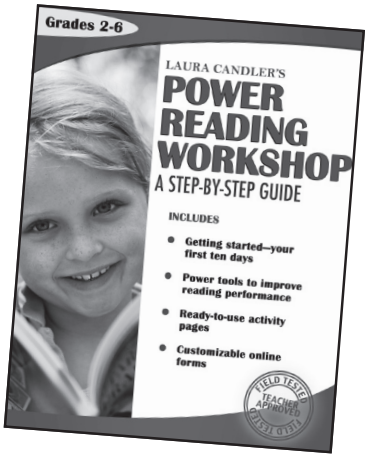
Everything you need, including reproducible worksheets, charts, and forms, are included to help you implement a Power Reading Workshop in your classroom today. Teachers around the world have used Laura's straightforward approach with fantastic results—that's what makes her program "field tested and teacher approved."



To purchase the book or digital download, or for more information, go to:
www.powerreadingworkshop.com

• • • • •

"Thank you, Laura, for giving us this life-changing teaching resource."
—Sue McKernan
Rochester, New York, 5th grade

"I am thrilled with the test score results!"
—Jenny Owens,
Cumming, Georgia, 4th grade

"I have seen enormous growth in my students—hundreds of Lexile points in just four months. More importantly, they are hooked on literature."
—Rebecca Barta,
Killeen, Texas, 3rd grade ELL

"Every student showed growth, some as much as 1.5 to 2 years in only five months."
—Linda Schuman,
West Palm Beach, Florida, 4th/5th grade inclusion
(over 50% special needs)

"Students have brought in their pillows and blankets, and beg me daily for reading time! I never thought I would hear fifth graders tell me that they want to read."
—Francie Kugelman,
Los Angeles, California, 5th grade

"I love all of the simple forms that accompany the program and the easy-to-implement approach."
—Kristi Swartz, Loveland, Ohio

COMPASS

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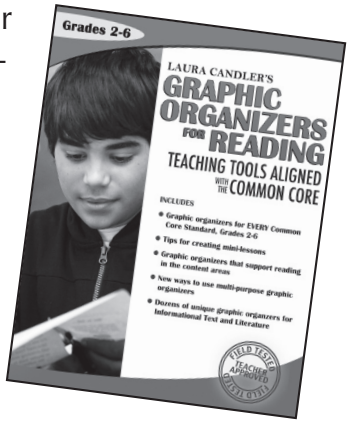
Laura Candler's

GRAPHIC ORGANIZERS FOR READING

TEACHING TOOLS ALIGNED WITH THE COMMON CORE

Laura Candler's Graphic Organizers for Reading: Teaching Tools Aligned with the Common Core is your guide to using graphic organizers to teach Common Core Reading Standards. Award-winning teacher Laura Candler has not only created a wealth of new graphic organizers, she gives step-by-step instructions on how to use each one.



Both brand-new teachers and experienced educators will benefit from the teaching tools and tips in *Graphic Organizers for Reading*. This book is the best guide for using graphic organizers to incorporate the Common Core Standards for Reading in your classroom.

Everything you need—reproducible graphic organizers, charts, and even suggested books and texts—are included to help you get started right away. Teachers around the world have used Laura's techniques with impressive results. That's what makes her programs "field tested and teacher approved."

To purchase the book or digital download, or for more information, go to:
www.GOforReading.com

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"Wow! This is a wonderful resource for teachers. It is very readable, with easy-to-follow instructions. The Common Core Standards and the suggested books for each graphic organizer are a great help in lesson planning. Both experienced teachers and 'newbies' will find this a great resource."

—Saundra McDonald
Salt Lake City, Utah, 3rd grade

"You have done an excellent job proividing the best resources along with specific suggestions for modeling strategies. You give teachers exactly what they need to deliver these lessons effectively!"

—Sue Roberts
Chicago, Illinois, Reading Specialist

"Using these graphic organizers with struggling readers enables them to be independent while responding to what they have read. Your instructions and suggestions for using the organizers are clear and make them adaptable to use in all subject areas."

—Jo-Ann Mumford
Nova Scotia, Canada, Program Support Teacher

"I love the book because it immediately relates to the Common Core. I have been teaching for 42 years – you help me to put the sparkle in my lessons!"

—Christine Provenzano
Smithtown, New York, 5th grade

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"The only way to learn mathematics is to do mathematics."

—Paul Halmos, mathematician

Laura Candler's Mastering Math Facts – Multiplication & Division: Aligned with the Common Core is a proven method for helping students achieve 100 percent mastery of multiplication and division math facts.

The program includes five components to help all your students become "Math Facts Masters":

- Alignment with the Common Core State Standards for Math Content and Practice
- Lessons and activities to teach foundational multiplication and division concepts
- Step-by-step instructions for the motivational system to ensure that every student in your class succeeds
- Assessment techniques to keep students on track to achieve proficiency with the math facts
- Math games and other strategies to make learning math facts fun

Whether you teach third, fourth, or fifth grade, you will find *Mastering Math Facts – Multiplication & Division* the best method to use for teaching the topic from the beginning and reinforcing struggling students. Everything you need is included in the book—reproducibles, patterns, activity sheets, games, and assessment materials.

The Author

Laura Candler is a teacher with 30 years of classroom experience. She has a Master's Degree in Elementary Education, National Board Certification as a Middle Childhood Generalist, and was a Milken Family Foundation Award winner in 2000.

FIELD TESTED TEACHER APPROVED FIELD TESTED

"Absolutely a great resource that I use every year. Everyone learns the math facts by December."

—Tisa Fischer
Bakersfield, California, Fifth Grade Teacher

"This is a wonderful tool to engage students in mastering math facts. Students work at beating their own goals and encourage each other to attain the class goal. It has promoted individual confidence and teamwork in my class."

— Natalie Alaniz
San Antonio, Texas, Third Grade Teacher

"Not only are the games easy to play, it aligned perfectly to the third grade Common Core Standards!"

—Dara Platon
Pittsboro, North Carolina, Third Grade Teacher

"This was, by far, the easiest way to teach multiplication I've ever used."

— Sharon Manka
Plumas Lake, California, Third Grade Teacher

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