

Grade 3 Multiplication and Division Unit of Study

This is a progressive unit of instruction beginning with students exploring multiplication as a set through the literature *Amanda Bean's Amazing Dream*. Students then explore multiplication as an array which takes them to understanding the distributive property. Although these lessons are multiplication and division specific as they were written, it's very easy to teach your students the concepts of multiplication and division side by side as they manipulate the objects and write the equations. In doing so you are walking your students from concrete to representational and finally abstract. Teaching your students the distributive property and encouraging them to compose and decompose numbers will support their multiplication fact fluency.

Operations and Algebraic Thinking

Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.

A bibliography of children's literature with a focus on multiplication is provided, which can be integrated so that students can connect through literature.

1. Amanda Bean's Amazing Dream, Cindy Neuschwander *
2. The Grapes of Math, Greg Tang *
3. Each Orange Had 8 Slices, Paul Giganti *
4. The Doorbell Rang, Pat Hutchins *
5. One Grain of Rice, Demi *
6. Sea Squares, Joy Hulme
7. The Hershey's Multiplication Book, Jerry Pallotta
8. The Lion's Share, Matthew McElliot
9. The Best of Times, Greg Tang
10. 7 x 9 = Trouble, Claudia Mills
11. 2 x 2 = Boo!, Loreen Leedy
12. Math Attack!, Joan Horton & Krysten Brooker
13. The King's Chessboard, David Birch & Devis Grebu
14. Ten Times Better, Richard Michelson

<p>Cluster 1: Represent and solve problems involving multiplication division</p> <p>Cluster 2: Understand properties of multiplication and the relationship between multiplication and division</p> <p>Cluster 3: Multiply and divide within 100</p> <p>Cluster 4: Solve problems involving the four operations, and identify and explain patterns in arithmetic</p> <p style="text-align: center;"><u>Parent Resources</u></p> <p><u>How to Teach the Multiplication Tables to Your Child</u> http://www.wikihow.com/Teach-the-Multiplication-Tables-to-Your-Child</p> <p><u>Using Arrays to Multiply</u> http://www.cpalms.org/Public/PreviewResourceUrl/Preview/126354</p> <p><u>The Multiplication Game</u> http://www.cpalms.org/Public/PreviewStandard/Preview/5361</p>	<p>15. <u>Divide and Ride</u>, Stuart Murphy</p> <p>16. <u>One Hundred Hungry Ants</u>, Elinor Pinczes</p> <p>17. <u>One Hungry Cat</u>, Joanne Rocklin & Rowane Murphy</p> <p>* This literature is referenced in a lesson below.</p>
<p style="text-align: center;">Introduction to Multiplication using Literature</p>	<p>http://www.cpalms.org/Public/PreviewResource/Preview/22401</p> <p>This lesson plan can be used to introduce the concept of multiplication to students through the use of literature. The story <i>Amanda Bean's Amazing Dream</i> is used to demonstrate the different ways to count items and how multiplication can make that</p>

	<p>process much faster.</p> <p><u>MAFS.3.OA.3.7:</u> Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations.</p>
<p>All About Multiplication</p>	<p>http://www.cpalms.org/Public/PreviewResourceUrl/Preview/23319</p> <p>This four-lesson unit from NCTM's Illuminations has students explore several meaning and representations of multiplication (number line, equal sets, arrays, and balanced equations). Other multiplication topics covered include: the commutative (order) property, the results of multiplying by 1 and 0, and the inverse property. Students will write and solve multiplication story problems, and convert word problems into equations.</p> <p><u>MAFS.3.OA.1.1:</u> Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each.</p> <p><u>MAFS.3.OA.3.7:</u> Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations.</p>
<p>How Many Circles? How Many Stars?</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/73250</p> <p>How many Circles? How many Stars? is an activity that will give students a visual representation of multiplication and repeated addition. It will also help students see multiplication as the combining of equal-size groups that can be represented with a multiplication equation.</p>

	<p><u>MAFS.3.OA.1.1:</u> Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each.</p>
<p>Each Orange Had 8 Slices: Multiplying Equal Groups</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/73278</p> <p>Students will learn how to represent and count equal groups through the use of literature and situational story problems. Using the story <i>Each Orange Had 8 Slices</i>, students will use manipulatives to create arrays to assist calculation of equal groups. Students will learn to write corresponding addition and multiplication sentences for the arrays.</p> <p><u>MAFS.3.OA.1.1:</u> Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each.</p>
<p>Skip Counting to Multiply (2's, 3's, 5's and 10's)</p>	<p>http://www.cpalms.org/Public/PreviewResource/Preview/73399</p> <p>Students will <u>build a conceptual understanding of multiplication</u> by creating a hundreds chart, using different colors to assist them with skip counting by 2, 3, 5 and 10. Students will discuss; "How many groups of (2, 3, 5 and/or 10)?" are in each number</p>

	<p><u>MAFS.3.OA.3.7:</u> Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations.</p> <p><u>MAFS.3.OA.1.3:</u> Use multiplication and division within 100 to solve work 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.</p>
<p>Introduction to Division</p>	<p>http://www.cpalms.org/Public/PreviewResourceUrl/Preview/1067</p> <p>"The lesson will help students develop an initial understanding of division and clarify how the four operations of addition, subtraction, multiplication, and division relate to and are separate from each other. The lesson begins with a brainstorming discussion which builds background and fosters comprehension. A big book, <i>The Doorbell Rang</i>, by Pat Hutchins, is used along with manipulatives to provide instruction at concrete and pictorial levels. Students will demonstrate what they have learned by writing a short story incorporating simple division." (ALEX - Alabama Learning Exchange)</p> <p><u>MAFS.3.OA.1.2:</u> Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ 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. <i>For example, describe a context in which a number of shares or a number of groups can be expressed as $56 \div 8$.</i></p>

	<p><u>MAFS.3.OA.1.3:</u> 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.</p>
<p>Pet Store Partitive Division</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/35840</p> <p>In this lesson students will model partitive division through the real-world activity of a pet store owner.</p> <p><u>MAFS.3.OA.1.2:</u> Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ 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. <i>For example, describe a context in which a number of shares or a number of groups can be expressed as $56 \div 8$.</i></p> <p><u>MAFS.3.OA.1.3:</u> 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.</p>
<p>Grandma Wants to Know!</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/73284</p> <p>Help Mom and Dad tell Grandma about Cindy's trip to the carnival using bar models and arrays to relate division to multiplication with an unknown factor.</p>

	<p><u>MAFS.3.OA.2.6:</u> Understand division as an unknown-factor problem. <i>For example, find $32 \div 8$ by finding the number that makes 32 when multiplied by 8</i></p>
<p>Cheezy Arrays</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/73412</p> <p>This lesson is a hands on activity that includes multiplication using arrays. The lesson also serves as a great transition from repeated addition to multiplication.</p> <p><i>Use Graph paper to show the arrays – concrete to representational.</i></p> <p><u>MAFS.3.OA.1.1:</u> Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each.</p> <p><u>MAFS.3.OA.1.3:</u> Use multiplication and division within 100 to solve work 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.</p>
<p>Amazing Arrays</p>	<p>http://www.cpalms.org/Public/PreviewResource/Preview/26760</p> <p>This is a hands-on lesson for introducing and practicing building arrays to create models that represent the distributive property of multiplication, and then using those arrays to draw models of the</p>

	<p>equations they represent.</p> <p><i>Use Graph paper to show the arrays – concrete to representational.</i></p> <p><u>MAFS.3.OA.3.7:</u> Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations.</p> <p><u>MAFS.3.OA.2.5:</u> Apply properties of operations as strategies to multiply and divide</p>
<p>Discovering the Mystery Factor Through Arrays</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/73450</p> <p>Students will begin with the use of manipulatives to solve for unknown factors by building arrays. They will progress to drawn models as mastery is shown with manipulatives.</p> <p><i>Use Graph paper to show the arrays – concrete to representational.</i></p> <p><u>MAFS.3.OA.1.4:</u> Determine the unknown whole number in a multiplication or division equation relating three whole numbers.</p>

Three is NOT a Crowd!

<http://www.cpalms.org/Public/PreviewResource/Preview/29229>

This lesson will provide students with practical application activities to help them understand how division is simply solving a problem with an unknown factor. Students will be given snacks in which they must share with their group members equally. This activity includes opportunities for students to use fact families when identifying unknown factors and a tic-tac-toe game to provide whole group practice as well as to be used at a center, or for independent reinforcement of the skills.

MAFS.3.OA.2.6: Understand division as an unknown-factor problem. *For example, find $32 \div 8$ by finding the number that makes 32 when multiplied by 8*

The Array Frame, your best friend

<http://www.cpalms.org/Public/PreviewResourceLesson/Preview/72733>

In this lesson, students will learn to use the structure of array frames to build familiarity and fluency with the array as a tool. Students will solve several multiplication word problems using the array as a representation.

Use Graph paper to show the arrays – concrete to representational.

	<p><u>MAFS.3.OA.1.3:</u> 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.</p>
<p>Giddy Up, Round Up: Relating Division to Multiplication</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/49479</p> <p>In this lesson, students will learn to solve division problems by relating them to multiplication facts. Practice materials focus on the 6's and 8's multiplication facts.</p> <p><u>MAFS.3.OA.1.4:</u> Determine the unknown whole number in a multiplication or division equation relating three whole numbers.</p>
<p>Making Sense of Multiplication to Build Fluency of 6's, 7's, 8's, and 9's</p>	<p>http://www.cpalms.org/Public/PreviewResource/Preview/73406</p> <p>This lesson will help students multiply numbers with factors of 6, 7, 8, or 9 through <u>decomposing numbers in an array and applying the distributive property</u>. Many times, these factors are difficult for students to recall from memory. <u>Teaching students how to use an array can give them a visual representation of the final product</u>. This visual can also help students to make the connection that multiplying whole numbers is a sum of equal groups. <u>Decomposing the numbers and using the distributive property is a strategy for students to use who are having trouble solving these higher factor multiplication facts</u>.</p>

	<p><i>Use Graph paper to show the arrays – concrete to representational.</i></p> <p><u>MAFS.3.OA.3.7:</u> Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations.</p>
<p>Apples, Oranges, and Bananas of Math?</p>	<p>http://www.cpalms.org/Public/PreviewResourceUrl/Preview/1052</p> <p>In this lesson, the students will work in independently or in small groups to write their own math riddles around the concepts of multiplication. The teacher will use the book, <i>The Grapes of Math</i> by Greg Tang.</p> <p><u>MAFS.3.OA.1.1:</u> Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each.</p> <p><u>MAFS.3.OA.1.3:</u> Use multiplication and division within 100 to solve work 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. Tang, to support this lesson.</p>
<p>Cookies for All</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/45560</p> <p>This lesson allows students to use everyday objects in order to understand equal shares. The lesson uses "The Doorbell Rang" by</p>

	<p>Pat Hutchins to engage students during the lesson and to make a connection by using literacy in mathematics.</p> <p><u>MAFS.3.OA.1.3:</u> Use multiplication and division within 100 to solve work 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.</p>
<p>Make Your Way With Arrays</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/29450</p> <p>This lesson walks the students from representational to the abstract very nicely! Students will solve multiplication and division word problems by drawing arrays and writing the related equation.</p> <p><i>Use Graph paper to show the arrays – concrete to representational.</i></p> <p><u>MAFS.3.OA.1.3:</u> Use multiplication and division within 100 to solve work 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.</p>
<p>Tasty Algebra: Using toasted O cereal to find the missing factor in a multiplication equation</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/39376</p> <p>In this lesson students will use Cheerios to solve multiplication equations relating 3 whole numbers from word problems that include missing factors ranging from one through ten. Students will</p>

	<p>also argue the validity of multiplication equations that include missing factors and products with corresponding word problems.</p> <p><u>MAFS.3.OA.1.4:</u> Determine the unknown whole number in a multiplication or division equation relating three whole numbers.</p>
<p>Getting the hang of two-step word problems</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/73238</p> <p>Students will solve two-step word problems involving subtraction and division and represent these problems using equations with a letter standing for the unknown quantity.</p> <p><u>MAFS.3.OA.4.8:</u> Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.</p>
<p>Water Park Fun Day</p>	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/69701</p> <p>This third grade MEA asks students to work as a team to figure out which activities they would like to do at the water park with a given amount of tickets and time. Students will make informed</p>

	<p>decisions about which activities and food and beverage items on which to spend their allotted tickets.</p> <p><u>MAFS.3.OA.4.8:</u> Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.</p>
<p>Mix It Up- Algebraic Thinking Math Project</p>	<p>http://www.cpalms.org/Public/PreviewResourceUrl/Preview/1694</p> <p>Using fruit salad problems "students will be introduced to proportional reasoning through modeling, sharing, and questioning techniques."</p> <p><u>MAFS.3.OA.4.8:</u> Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.</p> <p><u>MAFS.4.OA.3.5:</u> Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. <i>For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to</i></p>

	<i>alternate in this way.</i>
Tricky Rice Math Patterns MEA	<p>http://www.cpalms.org/Public/PreviewResourceLesson/Preview/69603</p> <p>This is a 3rd grade MEA that requires students to use mathematical patterns to solve the problem, along with the analysis of data. After reading <i>One Grain of Rice</i> by Demi, students will look for ways to help Rani's relative find a new pattern so she can secure a large supply of rice to feed the people of her province in India. The twist is likely to cause controversy, so prepare for some strong debates.</p> <p><u>MAFS.3.OA.4.9:</u> Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. <i>For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.</i></p>
Patterns in the multiplication table	<p>http://www.cpalms.org/Public/PreviewResourceUpload/Preview/43321</p> <p>The goal is to look for structure and identify patterns and then try to find the mathematical explanation for this. This problem examines the "checkerboard" pattern of even and odd numbers in a single digit multiplication table. The even numbers in the table are examined in depth using a grade appropriate notion of even,</p>

	<p>namely the possibility of reaching the number counting by 2's or expressing the number as a whole number of pairs.</p> <p><u>MAFS.3.OA.4.9:</u> Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. <i>For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.</i></p>
<p>The Power of Patterns</p>	<p>http://www.cpalms.org/Public/PreviewResource/Preview/31006</p> <p>Students will work a real world problem to discover similarities and differences between the patterns of adding 2 to a number and doubling a number. The problem is set in the real world context of twin brothers who choose different patterning strategies given by their grandma to save for buying a car.</p> <p><u>MAFS.3.OA.4.9:</u> Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. <i>For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.</i></p>

Supply List

Suggested class supplies for each student

Math Notebook/Journal
Math Folder
Scissors
Construction paper
Colored pencils
Pencils
Index cards
Place value charts
Blank hundreds charts
Number lines (can use string and index cards)
Number strips
(1 per 2 or 3 students) Egg cartons and small objects to show “groups of things”
Empty containers to show liquid volume (milk jugs, cans, jars, etc.)
Rulers

Operations and Algebraic Thinking

(class set) two colored circles
(class set) square tiles
graph paper
(class set) place value blocks
box of toasted O cereal
2 boxes of Cheeze Its
hundreds chart for each student