North Carolina Department of Public Instruction
INSTRUCTIONAL SUPPORT TOOLS
FOR ACHIEVING NEW STANDARDS

3rd Grade Mathematics ● Unpacked Contents
For the new Standard Course of Study that will be effective in all North Carolina schools in the 2018-19 School Year.

This document is designed to help North Carolina educators teach the 3rd Grade Mathematics Standard Course of Study. NCDPI staff are continually updating and improving these tools to better serve teachers and districts.

What is the purpose of this document?
The purpose of this document is to increase student achievement by ensuring educators understand the expectations of the new standards. This document may also be used to facilitate discussion among teachers and curriculum staff and to encourage coherence in the sequence, pacing, and units of study for grade-level curricula. This document, along with on-going professional development, is one of many resources used to understand and teach the NC SCOS.

What is in the document?
This document includes a detailed clarification of each standard in the grade level along with a *sample* of questions or directions that may be used during the instructional sequence to determine whether students are meeting the learning objective outlined by the standard. These items are included to support classroom instruction and are not intended to reflect summative assessment items. The examples included may not fully address the scope of the standard. The document also includes a table of contents of the standards organized by domain with hyperlinks to assist in navigating the electronic version of this instructional support tool.

How do I send Feedback?
Please send feedback to us at feedback@dpi.state.nc.us and we will use your input to refine our unpacking of the standards. Thank You!

Just want the standards alone?
You can find the standards alone at http://www.ncpublicschools.org/curriculum/mathematics/scos/.

Standards for Mathematical Practice

Practice	Explanation and Example
1. Make sense of problems and persevere in solving them.	In third grade, mathematically proficient students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Third grade students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" Students listen to other students' strategies and are able to make connections between various methods for a given problem.
2. Reason abstractly and quantitatively.	Mathematically proficient third grade students should recognize that a number represents a specific quantity. They connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities.
3. Construct viable arguments and critique the reasoning of others.	In third grade, mathematically proficient students may construct arguments using concrete referents, such as objects, pictures, and drawings. They refine their mathematical communication skills as they participate in mathematical discussions that the teacher facilities by asking questions such as "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking.
4. Model with mathematics.	Mathematically proficient students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart, list, or graph, creating equations, etc. Students require extensive opportunities to generate various mathematical representations and to both equations and story problems, and explain connections between representations as well as between representations and equations. Students should be able to use all of these representations as needed. They should evaluate their results in the context of the situation and reflect on whether the results make sense.
5. Use appropriate tools strategically.	Mathematically proficient third grader students consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper to find all the possible rectangles that have a given perimeter. They compile the possibilities into an organized list or a table, and determine whether they have all the possible rectangles.
6. Attend to precision.	Mathematically proficient third grader students develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the area of a rectangle they record their answers in square units.
7. Look for and make use of structure.	In third grade mathematically proficient students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to multiply and divide (commutative and distributive properties).
8. Look for and express regularity in repeated reasoning.	Mathematically proficient students in third grade should notice repetitive actions in computation and look for more shortcut methods. For example, students may use the distributive property as a strategy for using products they know to solve products that they don't know. For example, if students are asked to find the product of 7 x 8, they might decompose 7 into 5 and 2 and then multiply 5 x 8 and 2 x 8 to arrive at 40 + 16 or 56. In addition, third graders continually evaluate their work by asking themselves, "Does this make sense?"

Return to Standards

Represent and solve problems involving multiplication and division.

NC.3.OA.1 For products of whole numbers with two factors up to and including 10:

- Interpret the factors as representing the number of equal groups and the number of objects in each group.
- Illustrate and explain strategies including arrays, repeated addition, decomposing a factor, and applying the commutative and associative properties.

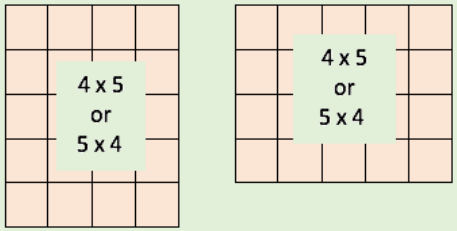
Clarification

In this standard, students develop an initial understanding of multiplication of whole numbers. Students recognize multiplication as a means to determine the total number of objects (product) when there are a specific number of groups (factor) with the same number of objects in each group (factor). Multiplication requires students to think in terms of groups of things rather than individual things. Students learn that the multiplication symbol 'x' means "groups of" and problems such as 5 x 7 refer to 5 groups of 7.

Students build on their work with repeated addition and rectangular arrays from Second Grade. They also begin applying properties of multiplication.

The commutative property (order property) states that the order of numbers does not matter when you are adding or multiplying numbers.

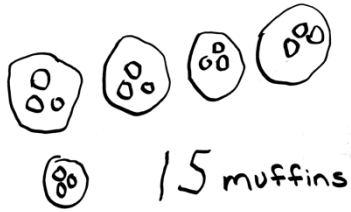
For example: If a student knows that 5 x 4 = 20, then they also know that 4 x 5 = 20. There is no "fixed" way to write the dimensions of an array as rows x columns or columns x rows. Students should have flexibility in being able to describe both dimensions of an array.



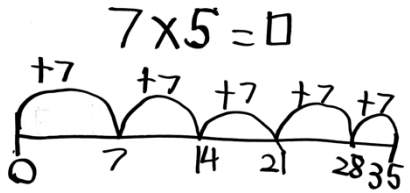
Students are introduced to the distributive property of multiplication, through decomposing a number, as a strategy for solving multiplication problems.

Checking for Understanding

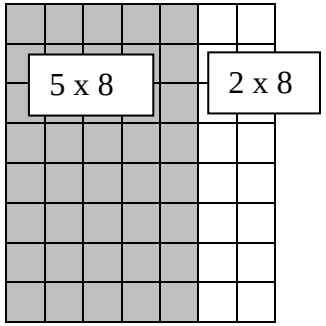
Jim purchased 5 packages of muffins. Each package contained 3 muffins. How many muffins did Jim purchase?



Sonya earns $7 a week pulling weeds. After 5 weeks of work, how much has Sonya worked? Write an equation and find the answer.



Joe has seven boxes of markers and each box has eight markers. Show how you could determine how many markers Joe has by decomposing a factor.

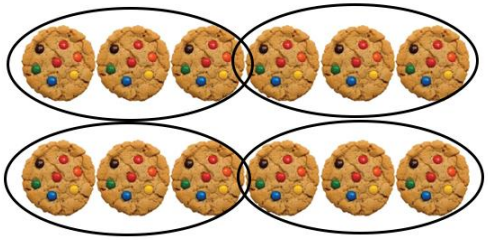


Return to Standards

Represent and solve problems involving multiplication and division.

NC.3.OA.2 For whole-number quotients of whole numbers with a one-digit divisor and a one-digit quotient:

- Interpret the divisor and quotient in a division equation as representing the number of equal groups and the number of objects in each group.
- Illustrate and explain strategies including arrays, repeated addition or subtraction, and decomposing a factor.

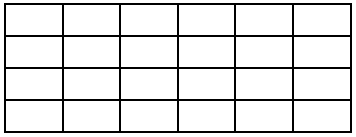
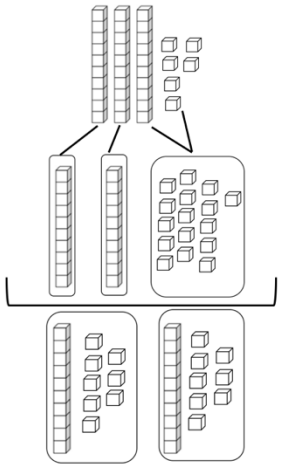
Clarification	**Checking for Understanding**
This standard focuses on two distinct models of division: partition models (fair share) and measurement (repeated subtraction) models. Partition models provide students with a total number and the number of groups. These models focus on the question, "How many objects are in each group so that the groups are equal?" Measurement (repeated subtraction) models provide students with a total number and the number of objects in each group. These models focus on the question, "How many equal groups can you make?"	Partition model: There are 12 cookies on the counter. If you are sharing the cookies equally among three bags, how many cookies will go in each bag?  Measurement model: There are 12 cookies on the counter. If you put 3 cookies in each bag, how many bags will you fill?  **Describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.** For example, 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.

Return to Standards

Represent and solve problems involving multiplication and division.

NC.3.OA.3 Represent, interpret, and solve one-step problems involving multiplication and division.

- Solve multiplication word problems with factors up to and including 10. Represent the problem using arrays, pictures, and/or equations with a symbol for the unknown number to represent the problem.
- Solve division word problems with a divisor and quotient up to and including 10. Represent the problem using arrays, pictures, repeated subtraction and/or equations with a symbol for the unknown number to represent the problem.

Clarification	**Checking for Understanding**
In this standard, students apply strategies to various multiplication and division situations to solve word problems. Students should use a variety of representations for creating and solving one-step word problems. The following table gives examples of a variety of problem solving contexts, in which students need to find the product, the group size, or the number of groups. Students should be given ample experiences to explore all of the different problem structures. Students in third grade should use a variety of pictures, such as stars, boxes, flowers to represent unknown numbers. Letters are also introduced to represent unknowns in third grade.	<u>Multiplication:</u> There are 24 desks in the classroom. If the teacher puts 6 desks in each row, how many rows are there? *This task can be solved by drawing an array by putting 6 desks in each row. This is an array model.*  *This task can also be solved by drawing pictures of equal groups.* *4 groups of 6 equals 24 objects*  *A student can also reason through the problem mentally or verbally, "I know 6 and 6 are 12. 12 and 12 are 24. Therefore, there are 4 groups of 6 giving a total of 24 desks in the classroom."* <u>Partition model of division: where the size of the groups is unknown:</u> The bag has 36 hair clips, and Laura and her friend want to share them equally. How many hair clips will each person receive?  *36 hair clips are represented with base ten blocks* *Each girl receives 1 ten when 2 tens are divided evenly among them. There are 1 ten and 6 ones left. The ten is decomposed into ten ones.* *Each girl receives 8 ones along with the 1 ten.* *Each girl receives 18 hair clips.*

Represent and solve problems involving multiplication and division.

NC.3.OA.3 Represent, interpret, and solve one-step problems involving multiplication and division.

- Solve multiplication word problems with factors up to and including 10. Represent the problem using arrays, pictures, and/or equations with a symbol for the unknown number to represent the problem.
- Solve division word problems with a divisor and quotient up to and including 10. Represent the problem using arrays, pictures, repeated subtraction and/or equations with a symbol for the unknown number to represent the problem.

Clarification	Checking for Understanding
	Measurement model of division: where the number of groups is unknown Max the monkey loves bananas. Molly, his trainer, has 24 bananas. If she gives Max 4 bananas each day, how many days will the bananas last?

Starting	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
24	24 – 4 = 20	20 – 4 = 16	16 – 4 = 12	12 – 4 = 8	8 – 4 = 4	4 – 4 = 0

The bananas will last for 6 days.

Understand properties of multiplication and the relationship between multiplication and division.

NC.3.OA.6 Solve an unknown-factor problem, by using division strategies and/or changing it to a multiplication problem.

Clarification	Checking for Understanding
This standard calls for students to use the relationship between multiplication and division in order to solve problems. Students can begin thinking about division in terms of finding a missing factor when: • Students have developed an understanding of the meaning of multiplication (in terms of finding the total number of objects (product) when there are a specific number of groups (factor) with the same number of objects in each group (factor). • They understand the relationship between multiplication and division Since multiplication and division are inverse operations, students are expected to explain their processes of solving division problems that can also be represented as unknown factor multiplication problems. Students extend work from earlier grades with their understanding of the meaning of the equal sign as "the same amount as" to interpret an equation with an unknown. When given 4 x ? = 40, they might think: • 4 groups of some number is the same as 40 • 4 times some number is the same as 40 • I know that 4 groups of 10 is 40 so the unknown number is 10. The missing factor is 10 because 4 times 10 equals 40.	Sarah did not know the answer to 63 divided by 7. Is each of the following an appropriate way for Sarah to think about the problem? Explain why or why not with a picture or words for each one. • "I know that 7 x 9 = 63, so 63 divided by 7 must be 9." • "I know that 7x10 = 70. If I take away a group of 7, that means that I have 7x9 = 63. So, 63 divided by 7 is 9." • "I know that 7x5 is 35. 63 minus 35 is 28. I know that 7x4 = 28. So, if I add 7x5 and 7x4 I get 63. That means that 7x9 is 63, or 63 divided by 7 is 9."

Return to Standards

Multiply and divide within 100.

NC.3.OA.7 Demonstrate fluency with multiplication and division with factors, quotients and divisors up to and including 10.

- Know from memory all products with factors up to and including 10.
- Illustrate and explain using the relationship between multiplication and division.
- Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

Clarification	Checking for Understanding
This standard calls for students to be fluent with multiplication and division. Students are fluent when they display accuracy, efficiency, and flexibility. Students develop fluency by understanding and internalizing the relationships that exist between and among numbers. By studying patterns and relationships in multiplication facts and relating multiplication and division, students build a foundation for fluency with multiplication and division facts. The focus of this standard extends beyond the traditional notion of *fact families*, by having students explore the inverse relationship of multiplication and division. "Know from memory" should focus on ample experiences working with manipulatives, pictures, arrays, word problems, and numbers to internalize the basic facts. Traditional flash cards or timed tests have not been proven as effective instructional strategies for developing fluency. Rather, numerous experiences with breaking apart actual sets of objects and developing relationships between numbers help children internalize parts of number and develop efficient strategies for fact retrieval. Strategies students may use to attain fluency include: • Multiplication by zeros and ones • Doubles (2s facts), Doubling twice (4s), Doubling three times (8s) • Tens facts (relating to place value, 5 x 10 is 5 tens or 50) • Five facts (half of tens) • Skip counting (counting groups of __ and knowing how many groups have been counted) • Square numbers (ex: 3 x 3) • Nines (10 groups less one group, e.g., 9 x 3 is 10 groups of 3 minus one group of 3) • Decomposing into known facts (6 x 7 is 6 x 6 plus one more group of 6) • Commutative Property of Multiplication • Fact families (Ex: 6 x 4 = 24; 24 ÷ 6 = 4; 24 ÷ 4 = 6; 4 x 6 = 24) • Missing factors Students should have exposure to multiplication and division problems presented in both vertical and horizontal forms. Equations in the form of a x b = c and c = a x b should be used interchangeably, with the unknown in different positions.	CC Elementary has 40 third graders. They are taking a field trip to a museum and want to have students in equal groups during the tour. What groups could they make? • Use your tiles or grid paper to show a model of how they could make the groups. • Draw a picture of your solutions. For each solution, write an equation. • Write a sentence to explain how you solved the problem. Bob knows that 2 × 9 = 18. How can he use that fact to determine the answer to the following question: 18 people are divided into pairs in P.E. class? How many pairs are there? Write a division equation and explain your reasoning. Mr. Nala's class is making a garden. They bought 40 tomato plants. They want them in rows that have the same number of plants. There needs to be between 2 and 10 plants in each row. • Use your tiles to show a model of how they could make the garden. For each solution, write an equation. • Write a sentence to explain how you solved the problem.

Return to Standards

Solve two-step problems.
NC.3.OA.8 Solve two-step word problems using addition, subtraction, and multiplication, representing problems using equations with a symbol for the unknown number.

Clarification	Checking for Understanding
This standard refers to two-step word problems using the addition, subtraction, and multiplication only. The size of the numbers should be limited to related 3rd grade standards (e.g., 3.OA.7 and 3.NBT.2). Adding and subtracting numbers should include numbers within 1,000, and multiplying numbers should include single-digit factors and products less than 100. This standard calls for students to represent problems using equations with a letter to represent unknown quantities.	Mike runs 2 miles a day. His goal is to run 25 miles. After 5 days, how many miles does Mike have left to run in order to meet his goal? Write an equation and find the solution (2 x 5 + m = 25). Ms. Jones's class is trying to earn $130 to provide food for the rescue animals at the local shelter. They already earned $90 at a penny drive. The class has two ways they could raise the rest of the money. They could sweep the lunch room for $10 per week or pick up trash in the school yard for $8 per week. Which job should the class do to earn the money the fastest? • Explain your solution using pictures, numbers, or words. • Write an equation for how you started the problem. Be sure to include the number of weeks required for each job.

Return to Standards

Explore patterns of numbers.
NC.3.OA.9 Interpret patterns of multiplication on a hundreds board and/or multiplication table.

Clarification	Checking for Understanding
This standard calls for students to examine patterns of multiplication. The ability to recognize and explain patterns in mathematics leads students to developing the ability to make generalizations, a foundational concept in algebraic thinking. Students need ample opportunities to observe and identify important numerical patterns related to operations. They should build on their previous experiences with properties related to addition and subtraction to investigate multiplication and division patterns. Students investigate multiplication tables in search of patterns and explain why these patterns make sense mathematically. • The multiples of 4, 6, 8, and 10 are all even because they can all be decomposed into two equal groups. • The doubles (multiples of 2) in a multiplication table fall on horizontal and vertical lines.	What do you notice about the shaded numbers in the multiplication table? *When one changes the order of the factors they will still get the same product, such as 6 x 5 = 30 and 5 x 6 = 30.*

x	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80

- On a multiplication chart, the products in each row and column increase by the same amount (skip counting).
- The multiples of any number fall on a horizontal and a vertical line due to the commutative property.
- All the multiples of 5 end in a 0 or 5 while all the multiples of 10 end with 0. Every other multiple of 5 is a multiple of 10.

9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100

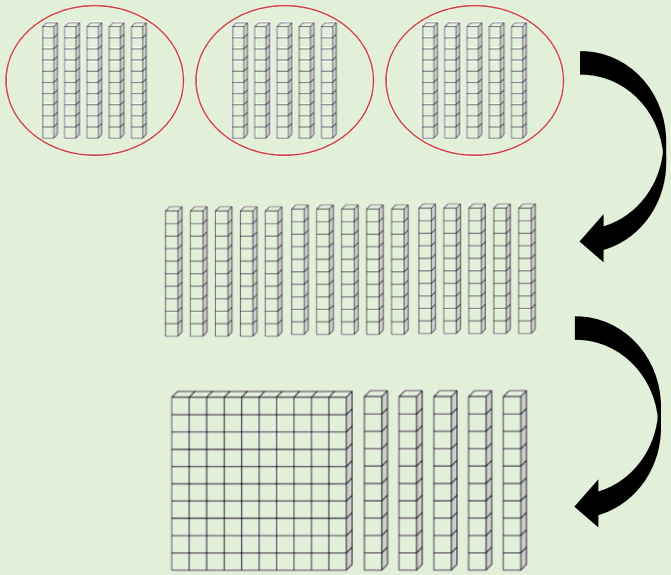
What do you notice about the pattern on the hundreds chart?

All of the shaded numbers are multiples of three. I can figure that out because if I start at 3 and count over three, I land on 6. That's like 3 + 3. If I go over three more, that's 9 or 3 + 3 + 3. I can keep adding three, or I can write multiplication problems instead like 3 x 2 or 3 x 3.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Return to Standards

Generalize place value understanding for multi-digit numbers.
NC.3.NBT.3 Use concrete and pictorial models, based on place value and the properties of operations, to find the product of a one-digit whole number by a multiple of 10 in the range 10–90.

Clarification	Checking for Understanding
In this standard, students extend on their work in multiplication by applying understanding of place value. The special role of 10 in the base-ten system is important in understanding multiplication of one-digit numbers with multiples of 10. Using the properties of operations (commutative, associative, and distributive) and place value, students are able to explain their reasoning. **For example:** The product 3 × 50 can be represented as 3 groups of 5 tens, which is 15 tens, which is 150. 	Max is trying to decide if he should go to Fast Foods, Green Groceries, or Super Store to buy biscuits for the school picnic. For $25, Max can buy: • 60 five-packs of biscuits from Fast Foods. or • 30 six-packs of biscuits from Green Groceries. or • 40 eight-packs of biscuits from Super Store. Where should Max go to buy biscuits? Use pictures, numbers, words, or equations to explain your reasoning.

Return to Standards