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

4th 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 4th 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.	Mathematically proficient students in grade 4 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. Fourth graders 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?" They listen to the strategies of others and will try different approaches. They often will use another method to check their answers.
2. Reason abstractly and quantitatively.	Mathematically proficient fourth 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. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions, record calculations with numbers, and represent or round numbers using place value concepts.
3. Construct viable arguments and critique the reasoning of others.	In fourth grade mathematically proficient students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain their thinking and make connections between models and equations. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like "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 fourth grade students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Fourth graders 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 fourth 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 or a number line to represent and compare decimals and protractors to measure angles. They use other measurement tools to understand the relative size of units within a system and express measurements given in larger units in terms of smaller units.
6. Attend to precision.	As fourth 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, they use appropriate labels when creating a line plot.
7. Look for and make use of structure.	In fourth grade mathematically proficient students look closely to discover a pattern or structure. For instance, students use properties of operations to explain calculations (partial products model). They relate representations of counting problems such as tree diagrams and arrays to the multiplication principal of counting. They generate number or shape patterns that follow a given rule.
8. Look for and express regularity in repeated reasoning.	Students in fourth grade should notice repetitive actions in computation to make generalizations Students use models to explain calculations and understand how algorithms work. They also use models to examine patterns and generate their own algorithms. For example, students use visual fraction models to write equivalent fractions.

Represent and solve problems involving multiplication and division.
NC.4.OA.1 Interpret a multiplication equation as a comparison. Multiply or divide to solve word problems involving multiplicative comparisons using models and equations with a symbol for the unknown number. Distinguish multiplicative comparison from additive comparison.

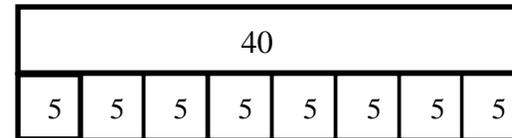| Clarification	Checking for Understanding
A *multiplicative comparison* is a situation in which one quantity is multiplied by a specified number to get another quantity (e.g., "*a* is *n* times as much as *b*"). In a multiplicative comparison, the underlying question is *what factor would multiply one quantity* in order to result in the other. Students should be able to identify and verbalize which quantity is being multiplied and which number tells how many times. Students should be able to translate comparative situations into equations with an unknown and solve. Many opportunities to solve contextual problems and write and identify equations and statements for multiplicative comparison should be provided.	Sally is five years old. Her mom is eight times older. How old is Sally's Mom? *Possible response:* $$5 \times 8 = 40.$$ A book costs \$18. That is 3 times more than a DVD. How much does a DVD cost? *Possible response:* $$18 \div \triangle = 3$$ $$\text{or } 3 \times \triangle = 18$$

Use the four operations with whole numbers to solve problems.
NC.4.OA.3 Solve two-step word problems involving the four operations with whole numbers.
- Use estimation strategies to assess reasonableness of answers.
- Interpret remainders in word problems.
- Represent problems using equations with a letter standing for the unknown quantity.

Clarification	Checking for Understanding
The focus in this standard is to have students use and discuss various strategies for solving word problems using all four operations. Students should build on the problem solving strategies they developed in earlier grades and apply those strategies to multi-step problems. Students should be introduced to a variety of estimation strategies. Estimation strategies include identifying when estimation is appropriate, determining the level of accuracy needed, selecting the appropriate method of estimation, and verifying solutions or determining the reasonableness of situations using various estimation strategies. Estimation strategies include, but are not limited to: • front-end estimation with adjusting (using the highest place value and estimating from the front end, making adjustments to the estimate by taking into account the remaining amounts), • clustering around an average (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate), • rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values), • using friendly or compatible numbers such as factors (students seek to fit numbers together - e.g., rounding to factors and grouping numbers together that have round sums like 100 or 1000), • using benchmark numbers that are easy to compute (students select close whole numbers for fractions or decimals to determine an estimate). Problems should be structured so that all acceptable estimation strategies will arrive at a reasonable answer. The assessment of estimation strategies should only have one reasonable answer (500 or 530), or a range (between 500 and 550). This standard also references interpreting remainders. Remainders should be put into context for interpretation. Ways to address remainders: • Remain as a left over • Partitioned into fractions or decimals • Discarded leaving only the whole number answer • Increase the whole number answer up one • Round to the nearest whole number for an approximate result	On a vacation, your family travels 267 miles on the first day, 194 miles on the second day and 34 miles on the third day. How many miles did they travel total? How do you know your answer is reasonable? *Possible responses:* **Student 1** I first thought about 267 and 34. I noticed that their sum is about 300. Then I knew that 194 is close to 200. When I put 300 and 200 together, I get 500. **Student 2** I first thought about 194. It is really close to 200. I also have 2 hundreds in 267. That gives me a total of 4 hundreds. Then I have 67 in 267 and the 34. When I put 67 and 34 together that is really close to 100. When I add that hundred to the 4 hundreds that I already had, I end up with 500. **Student 3** I rounded 267 to 300. I rounded 194 to 200. I rounded 34 to 30. When I added 300, 200 and 30, I know my answer will be about 530. --- Your class is collecting bottled water for a service project. The goal is to collect 300 bottles of water. On the first day, Max brings in 6 packs with 6 bottles in each container. About how many bottles of water still need to be collected? *Possible responses:* **Student 1** *First, I multiplied 6 and 6 which equals 36. I'm trying to get to 300. 36 is close to 40, and 40 plus 60 is 100. Then I need 2 more hundreds. So, we still need about 260 bottles.* **Student 2** *First, I multiplied 6 and 6 which equals 36. I know 36 is about 40 and 300-40 = 260, so we need about 260 more bottles.*

Use the four operations with whole numbers to solve problems.

NC.4.OA.3 Solve two-step word problems involving the four operations with whole numbers.
- Use estimation strategies to assess reasonableness of answers.
- Interpret remainders in word problems.
- Represent problems using equations with a letter standing for the unknown quantity.

Clarification	Checking for Understanding
	Write different word problems involving $44 \div 6 = ?$ where the answers are best represented as:

Problem A: 7
Problem B: 7 r 2
Problem C: 8
Problem D: 7 or 8
Problem E: $7 \frac{2}{6}$

Possible responses:

Problem A: 7. *Mary had 44 pencils. Six pencils fit into each of her pencil pouches. How many pouches did she fill? $44 \div 6 = p$; $p = 7 r 2$. Mary can fill 7 pouches completely.*

Problem B: 7 r 2. *Mary had 44 pencils. Six pencils fit into each of her pencil pouches. How many pouches could she fill and how many pencils would she have left? $44 \div 6 = p$; $p = 7 r 2$; Mary can fill 7 pouches and have 2 left over.*

Problem C: 8. *Mary had 44 pencils. Six pencils fit into each of her pencil pouches. What would the fewest number of pouches she would need in order to hold all of her pencils? $44 \div 6 = p$; $p = 7 r 2$; Mary needs 8 pouches to hold all of the pencils.*

Problem D: 7 or 8. *Mary had 44 pencils. She divided them equally among her friends before giving one of the leftovers to each of her friends. How many pencils could her friends have received? $44 \div 6 = p$; $p = 7 r 2$; Some of her friends received 7 pencils. Two friends received 8 pencils.*

Problem E: $7 \frac{2}{6}$. *Mary had 44 pencils and put six pencils in each pouch. What fraction represents the number of pouches that Mary filled? $44 \div 6 = p$; $p = \mathbf{7} \frac{2}{6}$*

There are 1,128 students going on a field trip. If each bus held 30 students, how many buses are needed?
$1,128 \div 30 = b$; $b = 37 R 6$; They will need 38 buses because 37 buses would not hold all of the students.

Return to Standards

Number and Operations in Base Ten

Generalize place value understanding for multi-digit whole numbers.
NC.4.NBT.1 Explain that in a multi-digit whole number, a digit in one place represents 10 times as much as it represents in the place to its right, up to 100,000.

Clarification	Checking for Understanding

This standard calls for students to extend their understanding of place value related to multiplying and dividing by multiples of 10. In this standard, students should reason about the magnitude of digits in a number. In the base-ten system, the value of each place is 10 times the value of the place to the immediate right. Students should reason and analyze the relationships of numbers that they are working with.	**Part 1:**
	Gina said, "In my pocket I have 25 of the same amount of dollar bills. What is the value of Gina's money if she has:
	  a) 25 one dollar bills
	  b) 25 ten dollar bills
	  c) 25 hundred dollar bills
	
	Part 2:
	Gina reasoned, "The value of the 2 when I have ten dollar bills is 200, but the value of the 2 when I have one dollar bills is only 20." Is Gina correct? Why or why not?
	
	Part 3:
	If you had 260 of each of the kinds of dollar bills in parts a, b, and c above; what would the value of each kind of bill be? Explain how you found your answer.

Use place value understanding and properties of operations to perform multi-digit arithmetic.
NC.4.NBT.5 Multiply a whole number of up to three digits by a one-digit whole number, and multiply up to two two-digit numbers with place value understanding using area models, partial products, and the properties of operations. Use models to make connections and develop the algorithm.

Clarification	Checking for Understanding
In this standard, students extend their understanding of multiplying a single-digit factor times a multiple of ten to multiplying a single-digit factor times multi-digit factors. Students will also begin their exploration of multiplying two two-digit factors. Students should be able to apply their understanding of place value and various forms of a number to compute products. Students will also use area models, partial products and properties of operations to solve multiplication problems Connections should be made between models and written equations, but it is not necessary for fourth grade students to use the standard algorithm. The standard algorithm for multiplication is not an expectation until fifth grade.	There are 25 dozen cookies in the bakery. What is the total number of cookies at the bakery? *Possible responses:* **Student A** 25 x12 I broke 12 up into 10 + 2 25 x 10 = 250 25 x 2 = 50 250 + 50 = 300 **Student B** 25 x 12 I broke 25 up into 5 groups of 5 5 x 12 = 60 There are 5 groups of 5 in 25 60 x 5 = 300 **Student C** 25 x 12 I doubled 25 and cut 12 in half to get 50 x 6 50 x 6 = 300 In the cafeteria, there are 14 long tables. Each table seats 16 students. How many students can eat in the cafeteria at one time?

Use place value understanding and properties of operations to perform multi-digit arithmetic.
NC.4.NBT.5 Multiply a whole number of up to three digits by a one-digit whole number, and multiply up to two two-digit numbers with place value understanding using area models, partial products, and the properties of operations. Use models to make connections and develop the algorithm.

Clarification	Checking for Understanding
	Using base ten blocks to model this problem, this student sees: $$(10 + 4) \times (10 + 6) =$$ 1 hundred $\mid$ 10 x 10 $\mid$ 100 4 tens $\mid$ 4 x 10 $\mid$ 40 6 tens $\mid$ 6 x 10 $\mid$ 60 24 ones $\mid$ 6 x 4 $\mid$ 24 14 x 16 = 224 100 + 40 + 60 + 24 = 224 There are 38 buses in the parking lot, and each bus holds 74 people. How many people are able to ride the buses? *This student draws an area model. The student uses the model and understanding of partial products to solve the multiplication problem.* 70 x 30 = 2,100 4 x 30 = 120 70 x 8 = 560 4 x 8 = 32 2,100 + 560 + 120 + 32 = 2,812

Use place value understanding and properties of operations to perform multi-digit arithmetic.
NC.4.NBT.6 Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors with place value understanding using rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, and/or the relationship between multiplication and division.

Clarification	Checking for Understanding
In this standard, students build on their understanding of the meaning of division and the relationship to multiplication by modeling, writing, and explaining division by a one-digit divisor. This standard calls for students to explore division through various strategies. Students should be able to apply their understanding of place value and various forms of a number to compute quotients. Students will also use arrays and area models, repeated subtraction, partial quotients and properties of operations to solve division problems This standard also references interpreting remainders. Remainders should be put into context for interpretation. Ways to address remainders: • Remain as a left over • Partitioned into fractions or decimals	A 4th grade teacher bought 4 new pencil boxes. She has 260 pencils. She wants to put the pencils in the boxes so that each box has the same number of pencils. How many pencils will there be in each box? *Possible responses:* • Using Base 10 Blocks: *Students build 260 with base 10 blocks and distribute them into 4 equal groups. Some students may need to trade the 2 hundreds for tens but others may easily recognize that 200 divided by 4 is 50.* • Using Place Value: $260 \div 4 = (200 \div 4) + (60 \div 4)$ • Using Multiplication: $4 \times 50 = 200, 4 \times 10 = 40, 4 \times 5 = 20; 50 + 10 + 5 = 65$; so, $260 \div 4 = 65$

Use place value understanding and properties of operations to perform multi-digit arithmetic.
NC.4.NBT.6 Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors with place value understanding using rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, and/or the relationship between multiplication and division.

| Clarification	Checking for Understanding

• Discarded leaving only the whole number answer
• Increase the whole number answer up one
• Round to the nearest whole number for an approximate result
 	
The focus of this standard is to build conceptual understanding of division. Students are expected to use various strategies and explain their thinking. Students are not expected to master the traditional algorithm until middle school.
	There are 592 students participating in Field Day. They are put into teams of 8 for the competition. How many teams get created?
	
	Student 1
	592 divided by 8
	
	There are 70 8's in 560
	
	592 - 560 = 32
	
	There are 4 8's in 32
	
	70 + 4 = 74
	
	Student 2
	592 divided by 8
	I know that 10 8's is 80
	If I take out 50 8's that is 400
	592 - 400 = 192
	I can take out 20 more 8's which is 160
	192 - 160 = 32
	4 groups of 8 is 32
	I have none left
	I took out 50, then 20 more, then 4 more. That's 74
	
	592
	-400
	       50
	192
	-160
	       20
	32
	-32 4
	0
	
	Student 3
	I want to get to 592
	
	8 x 25 = 200
	8 x 25 = 200
	8 x 25 = 200
	200 + 200 + 200 = 600
	600 - 8 = 592
	
	I had 75 groups of 8 and took one away, so there are 74 teams
	
	Using an Open Array or Area Model
	Example: $150 \div 6$
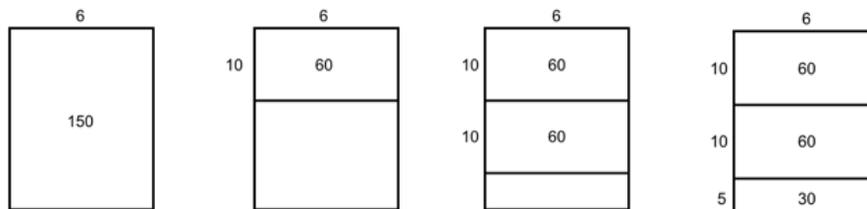
Use place value understanding and properties of operations to perform multi-digit arithmetic.
NC.4.NBT.6 Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors with place value understanding using rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, and/or the relationship between multiplication and division.

Clarification	Checking for Understanding

	Students make a rectangle and write 6 on one of its sides. They express their understanding that they need to think of the rectangle as representing a total of 150.
	
	 1. What number is a number close to 150? Students recognize that 6 x 10 is 60 so they record 10 as a factor and partition the rectangle into 2 rectangles and label the area aligned to the factor of 10 with 60. They express that they have only used 60 of the 150 so they have 90 left.
	
	 2. Recognizing that there is another 60 in what is left they repeat the process above. They express that they have used 120 of the 150 so they have 30 left.
	
	 3. Knowing that 6 x 5 is 30. They write 30 in the bottom area of the rectangle and record 5 as a factor.
	
	 4. Students express their calculations in various ways:
	
	 a. 150 $150 \div 6 = 10 + 10 + 5 = 25$
	     $\underline{- 60}$ (6 x 10)
	      90
	     $\underline{- 60}$ (6 x 10)
	      30
	     $\underline{-\ \ 30}$ (6 x 5)
	       0
	
	 b. $150 \div 6 = (60 \div 6) + (60 \div 6) + (30 \div 6) = 10 + 10 + 5 = 25$

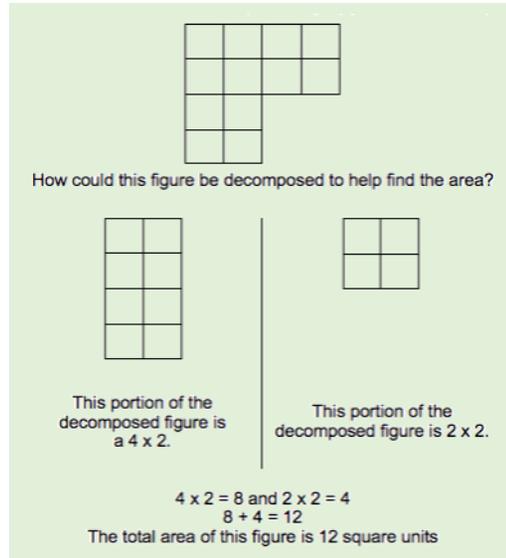|	
Solve problems involving area and perimeter. **NC.4.MD.3** Solve problems with area and perimeter. • Find areas of rectilinear figures with known side lengths. • Solve problems involving a fixed area and varying perimeters and a fixed perimeter and varying areas. • Apply the area and perimeter formulas for rectangles in real world and mathematical problems.	

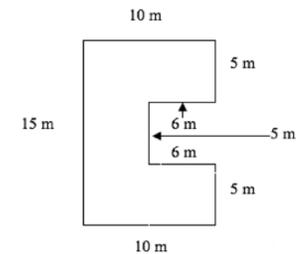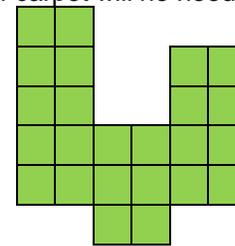| Clarification	Checking for Understanding
In this standard, students will apply their previous understanding of perimeter and area to problem situations. Students will be able to determine the area of a rectilinear figure. A rectilinear figure is a polygon that has all right angles. Recognizing that area is additive, students will be able to decompose the rectilinear figure into rectangles, determine the area of the rectangles, and use the areas of the rectangles to determine the area of the rectilinear figure. Students will solve problems that involve exploration of the relationship between perimeter and area in a rectangle. When given a fixed area, students will be able to determine all of the possible dimensions of the rectangle. When given a fixed perimeter, students will be able to determine all possible areas. Students learn to apply these understandings and formulas to the solution of real-world and mathematical problems. Note that "apply the formula" does not mean write down a memorized formula and put in known values. In fourth grade, working with perimeter and area of rectangles is still based in models and strategies.	A plan for a house includes a rectangular room with an area of 60 square meters and a perimeter of 32 meters. What are the length and the width of the room? A storage shed is pictured to the right. What is the total area? How could the figure be decomposed to help find the area? Mr. Rutherford is covering the miniature golf course with an artificial grass. How many 1-foot squares of carpet will he need to cover the entire course? You want to build a region that has an area of 12 square meters. What are the possible dimensions? Which dimensions require the least amount of fencing? *Possible solution:*

Area	Length	Width	Perimeter
12 sq. m	1 m	12 m	26 m
12 sq. m.	2 m	6 m	16 m
12 sq. m	3 m	4 m	14 m
12 sq. m	4 m	3 m	14 m
12 sq. m	6 m	2 m.	16 m
12 sq. m	12 m	1 m	26 m