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

5th 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 5th 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

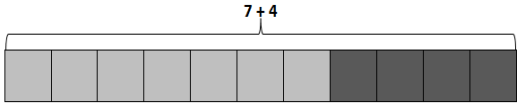
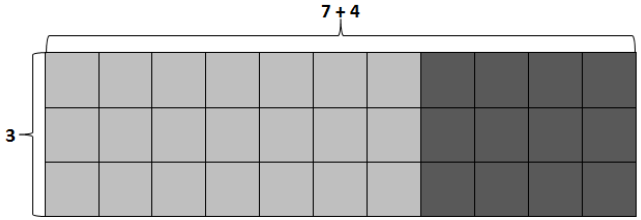
Practice	Explanation and Example
1. Make sense of problems and persevere in solving them.	Mathematically proficient students in grade 5 should solve problems by applying their understanding of operations with whole numbers, decimals, and fractions including mixed numbers. They solve problems related to volume and measurement conversions. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?".
2. Reason abstractly and quantitatively.	Mathematically proficient students in grade 5 should recognize that a number represents a specific quantity. They connect quantities 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 that record calculations with numbers and represent or round numbers using place value concepts.
3. Construct viable arguments and critique the reasoning of others.	In fifth grade mathematical proficient students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain calculations based upon models and properties of operations and rules that generate patterns. They demonstrate and explain the relationship between volume and multiplication. 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 students in grade 5 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. Fifth graders should evaluate their results in the context of the situation and whether the results make sense. They also evaluate the utility of models to determine which models are most useful and efficient to solve problems.
5. Use appropriate tools strategically.	Mathematically proficient fifth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use unit cubes to fill a rectangular prism and then use a ruler to measure the dimensions. They use graph paper to accurately create graphs and solve problems or make predictions from real world data.
6. Attend to precision.	Mathematically proficient students in grade 5 continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to expressions, fractions, geometric figures, and coordinate grids. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the volume of a rectangular prism they record their answers in cubic units.
7. Look for and make use of structure.	In fifth grade mathematically proficient students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to add, subtract, multiply and divide with whole numbers, fractions, and decimals. They examine numerical patterns and relate them to a rule or a graphical representation.
8. Look for and express regularity in repeated reasoning.	Mathematically proficient fifth graders use repeated reasoning to understand algorithms and make generalizations about patterns. Students connect place value and their prior work with operations to understand algorithms to fluently multiply multi-digit numbers and perform all operations with decimals to hundredths. Students explore operations with fractions with visual models and begin to formulate generalizations.

Return to Standards

Write and interpret numerical expressions.

NC.5.OA.2 Write, explain, and evaluate numerical expressions involving the four operations to solve up to two-step problems. Include expressions involving:

- Parentheses, using the order of operations.
- Commutative, associative and distributive properties.

Clarification	**Checking for Understanding**
This standard calls for students to verbally describe the relationship between expressions without actually calculating them. Students will also need to apply their reasoning of the four operations as well as place value while describing the relationship between numbers. The standard does not include the use of variables, only numbers and signs for operations.	Write an expression for the number of points Eric has at the end of the game. Do not evaluate the expression. The expression should keep track of what happens in each step listed below. • John is playing a video game. At a certain point in the game, he has 32,700 points. Then, the following events happen, in order: • He earns 1760 additional points. • He loses 4890 points. • The game ends, and his score doubles. • John's sister Erica plays the same game. When she is finished playing, her score is given by the expression: 4(31,500 + 2560) – 8760. • Describe a sequence of events that might have led to Erica earning this score. *Adapted from Illustrative Mathematics (www.illustrativemathematics.org)* Below is a picture that represents 7 + 4  • Draw a picture that represents 3 x (7 + 4) • How many times bigger is the value of 3 x (7 + 4) than 7 + 4? Explain your reasoning. *Possible responses:*  *The value of 3 x (7 + 4) is three times the value of 7 + 4. We can see this in the picture since 3 x (7 + 4) is visually represented as 3 equal rows with 7 + 4 squares in each row.*

Write and interpret numerical expressions.

NC.5.OA.2 Write, explain, and evaluate numerical expressions involving the four operations to solve up to two-step problems. Include expressions involving:

- Parentheses, using the order of operations.
- Commutative, associative and distributive properties.

Clarification	Checking for Understanding
	 *In this type of picture, the stuent shows that the numbers 7 + 4 are represented by the number of objects, and the number of groups represents the multiplier.* *Adapted from Illustrative Mathematics (www.illustrativemathematics.org)* Describe how the expression 5(10 x 10) relates to 10 x 10. *Possible response:* *The expression 5(10 x 10) is 5 times larger than the expression 10 x 10 since I know that I that 5(10 x 10) means that I have 5 groups of (10 x 10).*

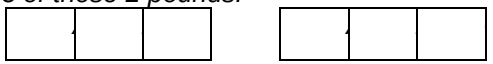
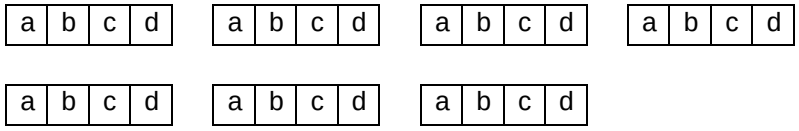
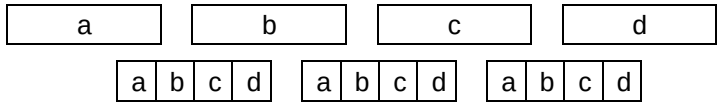
Return to Standards

Return to Standards

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

NC.5.NF.3 Use fractions to model and solve division problems.

- Interpret a fraction as an equal sharing context, where a quantity is divided into equal parts.
- Model and interpret a fraction as the division of the numerator by the denominator.
- Solve one-step word problems involving division of whole numbers leading to answers in the form of fractions and mixed numbers, with denominators of 2, 3, 4, 5, 6, 8, 10, and 12, using area, length, and set models or equations.

Clarification	**Checking for Understanding**
While working on NC.5.NF.3, students are expected to associate fractions with division, understanding that 5 ÷ 3 can be written and expressed as 5/3. Students should explain this by working with their understanding of division as equal sharing and be able to represent this work using area, length, and set models with the denominators specified in the standard.	If 3 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? *Possible solutions:* *Students might partition each pound among the 3 people, so that each person gets 1/3 of every pound and since there are 50 pounds, each person's total weight would equal 50 x 1/3 = 50/3 = 16 and 2/3 pounds.* *Students may solve 50 divided by 3 by multiplying by 3 up to 50.* *16 x 3 = 48* *50 is 2 away from 48 so there is a remainder of 2.* *The remaining 2 pounds would get divided among the 3 people, so each person gets 2/3 of those 2 pounds.*  *Students would each get 16 + 2/3 or 16 and 2/3 pounds of rice.* --- There are 7 packages of crackers on the counter. If Nina divides them equally between herself and 3 friends, how many packages does each person get? *Possible student work:* *There are 7 packages that are being equally shared among 4 people. I can write that as 7 divided by 4.*  *Each person gets 7 fourths, which can be represented as 7 x ¼ = 7/4.* *Possible student work:* 

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

NC.5.NF.3 Use fractions to model and solve division problems.

- Interpret a fraction as an equal sharing context, where a quantity is divided into equal parts.
- Model and interpret a fraction as the division of the numerator by the denominator.
- Solve one-step word problems involving division of whole numbers leading to answers in the form of fractions and mixed numbers, with denominators of 2, 3, 4, 5, 6, 8, 10, and 12, using area, length, and set models or equations.

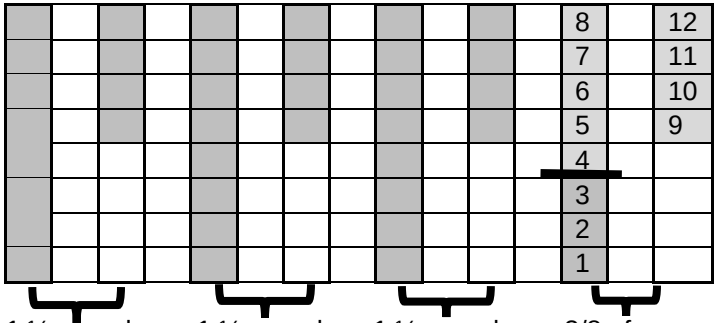
Clarification	Checking for Understanding
	Each person will receive 1 whole package and 3 smaller portions of a package. The smaller portions are ¼ of a package each, so each person will receive 1 and ¾ packages.

Return to Standards

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

NC.5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction, including mixed numbers.

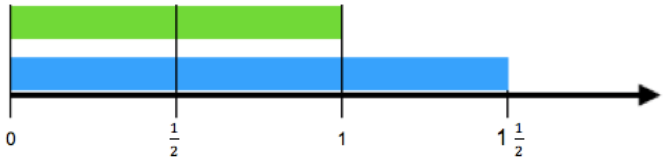
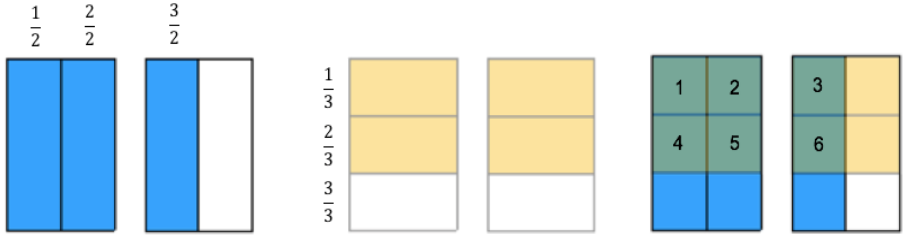
- Use area and length models to multiply two fractions, with the denominators 2, 3, 4.
- Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number and when multiplying a given number by a fraction less than 1 results in a product smaller than the given number.
- Solve one-step word problems involving multiplication of fractions using models to develop the algorithm.

Clarification	Checking for Understanding
This standard extends students' work of multiplication from earlier grades. In fourth grade, students worked with recognizing that a fraction such as 3/4 can be represented as 3 pieces that are each one-fourth (3 x (1/4)) and multiplied fractions less than one by whole numbers. This standard references both the multiplication of a fraction by a whole number and the multiplication of two fractions, including mixed numbers, with ONLY the denominators 2, 3, and 4. This is new for 5th grade. Students are expected to create and use visual fraction models (area models, tape diagrams, number lines) during their work with this standard. The language in the Standard "develop the algorithm" means that models should always be used and the algorithm is limited to only exposure at the same time as models in Grade 5.	Use area and length models to multiply two fractions, with the denominators 2,3, and 4. There are 3 ¼ packages of pencils on the desk. One full package weighs 1 ½ pounds. How much do all of the containers weigh?  *I know 3 packages = 1 ½ + 1 ½ + 1 ½ = 4 ½ pounds. For the last package in the picture I need ¼ of 1 1/2. Based on the picture 1 ½ = 12/8 so when I divided the 12/8 into fourths ¼ was equal to 3/8, which is 3/8 of a pound. I added 3/8 + 4 ½ to get my answer which is 3/8 + 4 and 4/8 which is 4 and 7/8.*

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

NC.5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction, including mixed numbers.

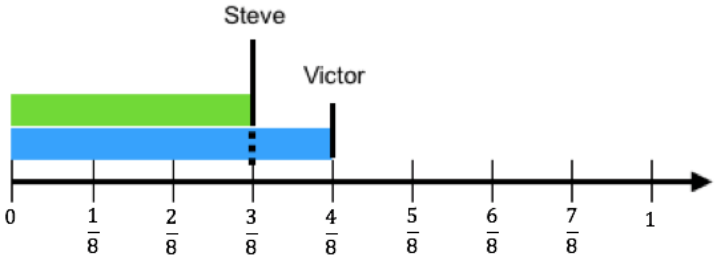
- Use area and length models to multiply two fractions, with the denominators 2, 3, 4.
- Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number and when multiplying a given number by a fraction less than 1 results in a product smaller than the given number.
- Solve one-step word problems involving multiplication of fractions using models to develop the algorithm.

Clarification	**Checking for Understanding**
	Paige has 1 ½ feet of rope for a project. She only needs 2/3 of it. How much rope does she need?  *1 ½ is equal to 3/2. Since we needed 2/3 of the rope my picture shows that 1/3 of 3/2 is ½.* *So, 2/3 of 3/2 is ½ plus ½ which is 1.* Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number and when multiplying a given number by a fraction less than 1 results in a product smaller than given number. Sonya is multiplying 2/3 * 3/2. She tells Susan that her product will be greater than 2/3. Is Sonya correct? Model the problem and explain why Sonya is correct or not.  *Sonya is correct. Since 3/2 is greater than ,1 the product of 2/3 * 3/2 will be greater than 2/3. In the picture we see that the answer is 3/3 or 1, which is greater than 2/3.* <u>Solve one-step word problems involving multiplication of fractions using models to develop the algorithm.</u> Victor runs 1/2 of a mile each day. Steve runs 3/4 of the distance that Victor runs. How long does Steve run? Use a model and write a sentence to support your answer. Explain how the algorithm matches your answer.

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

NC.5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction, including mixed numbers.

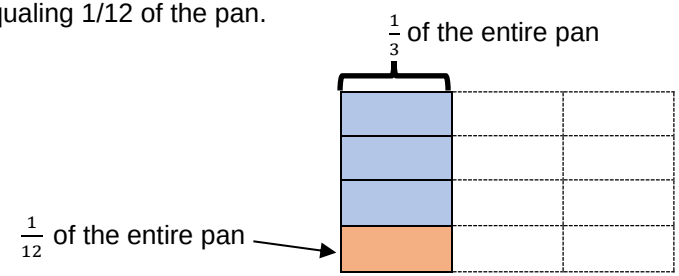
- Use area and length models to multiply two fractions, with the denominators 2, 3, 4.
- Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number and when multiplying a given number by a fraction less than 1 results in a product smaller than the given number.
- Solve one-step word problems involving multiplication of fractions using models to develop the algorithm.

Clarification	Checking for Understanding
	Steve runs less than Victor. Victor ran ½ a mile each day which is equal to 4/8 of a mile each day. Steve ran ¾ of Victor's distance. In the picture I partitioned ½ into 4 equal parts and each of those parts was 1/8. Steve ran 3 of those 4 parts, which can be represented by 1/8 + 1/8 + 1/8 or 3 x 1/8, which equals 3/8. 

Return to Standards

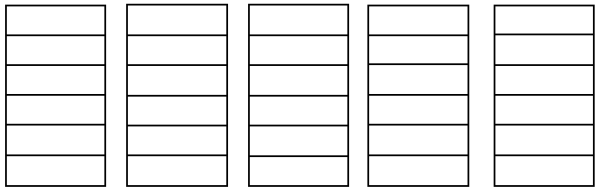
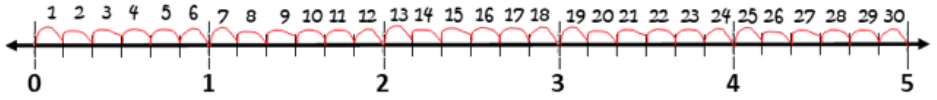
Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

NC.5.NF.7 Solve one-step word problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions using area and length models, and equations to represent the problem.

Clarification	Checking for Understanding
While students are working on NC.5.NF.7, this is the first time that students are dividing with fractions. In fourth grade students divided whole numbers, and multiplied a whole number by a fraction. The concept *unit fraction* is a fraction that has a one as the numerator. Students should be able to model all of the word problems using area and length models. There is no limit with the denominators since they are dividing a whole number by a unit fraction OR a unit fraction by a whole number. The algorithm to divide fractions should not be introduced in Grade 5.	<u>Unit Fraction Divided by a Whole Number:</u> Four students sitting at a table were given 1/3 of a pan of brownies to share. How much of the whole pan will each student get if they share the section of brownies equally? The diagram shows the 1/3 pan divided into 4 equal shares with each share equaling 1/12 of the pan.  <u>Whole Number Divided by a Unit Fraction:</u> Create a story context for 5 ÷ 1/6. Find your answer and then draw a picture to prove your answer and use multiplication to reason about whether your answer makes sense. How many 1/6 are there in 5?

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

NC.5.NF.7 Solve one-step word problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions using area and length models, and equations to represent the problem.

Clarification	**Checking for Understanding**
	Student 1: *There are 5 cups of goldfish on the counter. Each student receives 1/6 of a cup of goldfish. How many students can be fed with the 5 cups of goldfish?*  *There are 30 pieces that are 1/6 of a cup. 30 x 1/6 = 30/6 = 5 cups.* Student 2: *I have 5 feet of yarn. For my project I have to cut the yarn into pieces that are one-sixth of a foot long. How many pieces will I have?* 

Return to Standards