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**

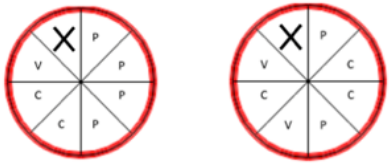
| Practice | Explanation and Example |
|---|---|
| 1. Make sense of problems and persevere in solving them. | Mathematically proficient students in grade 4 know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem 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. |

Return to Standards

***Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.***

**NC.4.NF.3** Understand and justify decompositions of fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100.

- Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
- Decompose a fraction into a sum of unit fractions and a sum of fractions with the same denominator in more than one way using area models, length models, and equations.
- Add and subtract fractions, including mixed numbers with like denominators, by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
- Solve word problems involving addition and subtraction of fractions, including mixed numbers by writing equations from a visual representation of the problem.

| **Clarification** | **Checking for Understanding** |
|---|---|
| NC.4.NF.3 calls for students to solve addition and subtraction problems with like denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100. A unit fraction is a term that identifies the size of 1 fractional piece in a whole. For example, 1/3 is the unit fraction that identifies a whole being divided into 3 equal pieces. Just as there are 3, one inch units in the length of 3 inches, there are 2, 1/3 units in the fraction 2/3.<br><br>The first two bullets focus on the conceptual development of what addition and subtraction of fractions looks like with area and length models. These models should also be used to support students' work when they add and subtract fractions in the latter two bullets of this standard. When students are able to fluently decompose fractions, including mixed numbers, it supports their work when adding and subtracting fractions. | After a pizza party there is 7/8 of a pizza left. Some pieces of the pizza are cheese, some are pepperoni, and some are vegetable. What fraction of a pizza could be cheese, pepperoni, and vegetable? Draw a picture and write an equation to represent the amounts of each type of pizza that are remaining. Find at least two combinations.<br><br>*Possible student response:*<br>*4/8 + 2/8 + 1/8 = 7/8*  *2/8 + 3/8 + 2/8 = 7/8*<br>  <br><br><br>There is some firewood on the pile. Mr. Mickelson adds 7/8 pounds of firewood. If there is now 2 and 1/8 of firewood on the pile how much firewood was first there?<br><br>*Possible student responses:*<br>Student 1<br>*I wrote the equation 2 1/8 – 7/8 to find out how much firewood was first there. I then drew a picture of 2 and 1/8 and crossed out 7/8. I had 1 and 2/8 or 1 and 1/4 left.*<br>  <br>Student 2<br>*I drew 7/8 and then added on until I reached 2 and 1/8. I then went back and counted. I added 1/8 + 1 + 1/8 which is 1 and 2/8 or 1 and ¼ pounds.*<br>  <br>Student 3 |

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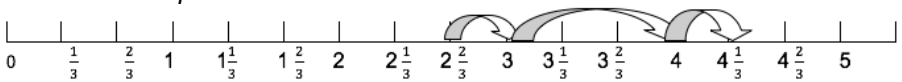
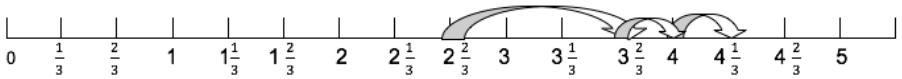
- Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
- Decompose a fraction into a sum of unit fractions and a sum of fractions with the same denominator in more than one way using area models, length models, and equations.
- Add and subtract fractions, including mixed numbers with like denominators, by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
- Solve word problems involving addition and subtraction of fractions, including mixed numbers by writing equations from a visual representation of the problem.

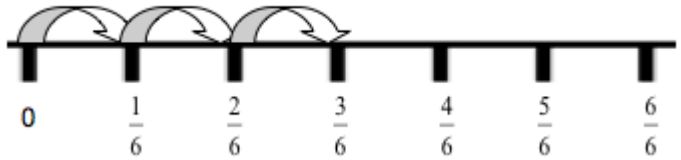
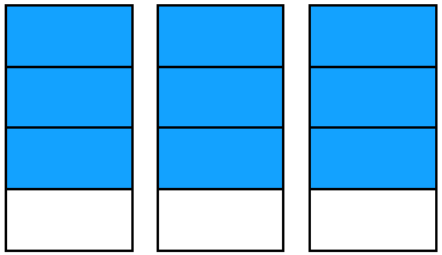
| Clarification | Checking for Understanding |
|---|---|
| | *I renamed 2 and 1/8 into an equivalent fraction 17/8. I then took 7/8 away from 17/8 which got me an answer of 10/8. When I drew the picture, I realized 10/8 is 1 whole and 2/8, which is 1 and 2/8 pounds.*<br><br>Brielle ran 1 and 2/3 miles less than Kim. Brielle ran 2 and 2/3 miles. How far did Kim run? Draw a number line and an equation to support your answer.<br><br>*Possible student responses:*<br>Student 1:<br>*I started at 2 and 2/3 since that was how far Brielle ran. Since Brielle ran less than Kim I knew I had to add 1 and 2/3. I broke the 2/3 up into 2 jumps of a 1/3 so I could land on 3, then jump to 4, then landed on 4 and 1/3. An equation is 2 2/3 + 1 2/3 = 4 1/3.*<br>  <br>Student 2:<br>*I started at 2 and 2/3 since that was how far Brielle ran. Since Brielle ran less than Kim I knew I had to add 1 and 2/3. I jumped 1 to land on 3 and 2/3. I then made 2 jumps of 1/3 and landed on 4 and 1/3. An equation is 2 2/3 + 1 2/3 = 4 1/3.*<br>  |

Return to Standards

***Use unit fractions to understand operations of fractions.***

**NC.4.NF.4** Apply and extend previous understandings of multiplication to:

- Model and explain how fractions can be represented by multiplying a whole number by a unit fraction, using this understanding to multiply a whole number by any fraction less than one.
- Solve word problems involving multiplication of a fraction by a whole number.

| **Clarification** | **Checking for Understanding** |
|---|---|
| This standard calls for students to understand a fraction as a whole number of groups of a unit fraction. A unit fraction is a term that identifies the size of 1 fractional piece in a whole. For example, 1/3 is the unit fraction that identifies a whole being divided into 3 equal pieces. Just as there are 3, one inch units in the length of 3 inches, there are 2, 1/3 units in the fraction 2/3.<br><br>They use a unit fraction as well as repeated addition to establish a foundation for the process of multiplying a whole number by a fraction (4 x 2/3 = 2/3 + 2/3 + 2/3 + 2/3 = (4x2)/3. Students use both area and length models to explore and solve word problems. All fractions are limited to the denominators of 2, 3, 4, 5, 6, 8, 10, 12. | Express the fraction 3/6 as the product of a whole number and a unit fraction. Draw a model which supports your answer.<br><br>Possible student response:<br>3/6 = 3 * 1/6.<br>  <br><br>Tomas and Hector are running at P.E. Tomas runs 3/4 of a mile. Hector runs 3 times as far as Tomas. How far did Hector run?<br>  <br>*Hector ran ¾ times 3 = 9/4 miles.* |

Return to Standards

***Understand decimal notation for fractions and compare decimal fractions.***

**NC.4.NF.6** Use decimal notation to represent fractions.

- Express, model and explain the equivalence between fractions with denominators of 10 and 100.
- Use equivalent fractions to add two fractions with denominators of 10 or 100.
- Represent tenths and hundredths with models, making connections between fractions and decimals.

**Clarification**

Students work with decimals for the first time in fourth grade. Students should have ample opportunities to explore and reason about the idea that a number can be represented as both a fraction and a decimal. This standard establishes the connection that a fraction that has been equally partitioned into 10 or 100 equal parts ($10^{th}$ and 100ths) can also be written as a decimal.

Students make connections between fractions with denominators of 10 and 100 and the place value chart.

By reading fraction names, students say 32/100 as thirty-two hundredths and rewrite this as 0.32 or represent it on a place value model as shown below.

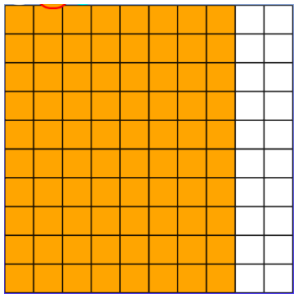
| Hundreds | Tens | Ones | • | Tenths | Hundredths |
|---|---|---|---|---|---|
| | | | • | 3 | 2 |

**Checking for Understanding**

Rosita has 8/10 of a meter of ribbon. However, the directions for her craft product have directions written about hundredths of a meter. What is an equivalent decimal to 8/10 to the hundredths place?

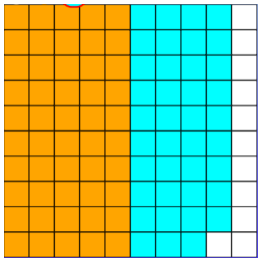
*Possible response:*

*I shaded in 8 columns on the decimal grid. That is the same as 80/100 which can also be written as 0.8 or 0.80.*



Mitch swam 5/10 of a mile on Saturday and 39/100 a mile on Sunday. How much did Mitch swim on the two days? Use a decimal grid to show your answer and write your answer as a decimal.

*Possible response:*



*89 of the one hundred squares are shaded so Mitch swam 89/100 of a mile. I can also write 89/100 as 0.89.*