



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 mathematically 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](#)

Operations and Algebraic Thinking

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

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.

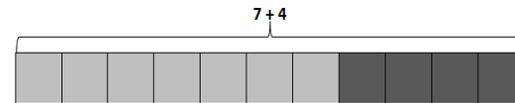
Checking for Understanding

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.

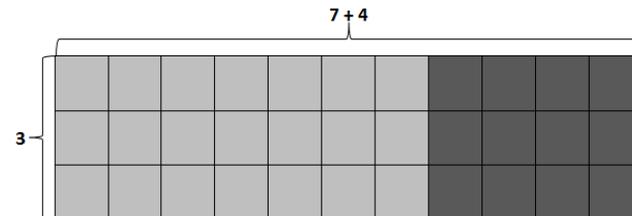
Adapted from Illustrative Mathematics (www.illustrativemathematics.org)

Below is a picture that represents $7 + 4$



- Draw a picture that represents $3 \times (7 + 4)$
- How many times bigger is the value of $3 \times (7 + 4)$ than $7 + 4$? Explain your reasoning.

Possible responses:



The value of $3 \times (7 + 4)$ is three times the value of $7 + 4$. We can see this in the picture since $3 \times (7 + 4)$ 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 student 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 $5(10 \times 10)$ relates to 10×10 .

Possible response:

The expression $5(10 \times 10)$ is 5 times larger than the expression 10×10 since I know that $5(10 \times 10)$ means that I have 5 groups of (10×10) .

Return to [Standards](#)

Number and Operations in Base Ten

Perform Operations with decimals.

NC.5.NBT.7 Compute and solve real-world problems with multi-digit whole numbers and decimal numbers.

- Add and subtract decimals to thousandths using models, drawings or strategies based on place value.
- Multiply decimals with a product to thousandths using models, drawings, or strategies based on place value.
- Divide a whole number by a decimal and divide a decimal by a whole number, using repeated subtraction or area models. Decimals should be limited to hundredths.
- Use estimation strategies to assess reasonableness of answers.

Clarification

This standard extends students' previous experiences with adding and subtracting whole numbers and their understanding of place value with decimals. In this standard, students use various strategies to compute problems in context with the four operations. Computation is limited to products to thousandths and division of decimals to hundredths.

This standard requires that students utilize models, drawings, and strategies based on place value rather than relying on algorithms. This standard focuses on student understanding of use place value when computing rather than learning rules that involve moving the decimal point with little connection to the meaning of the operations. The use of symbolic notations involves having students record the answers to computations ($2.25 \times 3 = 6.75$), but should not be done without models or pictures.

This standard also requires students to use estimation strategies to determine if an answer is reasonable. For example:

- When adding $3.6 + 1.7$, a student might estimate the sum to be larger than 5 because 3.6 is more than $3\frac{1}{2}$ and 1.7 is more than 1 $\frac{1}{2}$.
- When subtracting $5.4 - 0.8$, student might estimate the answer to be a little more than 4.4 because a number less than 1 is being subtracted.
- When multiplying 6×2.4 , a student might estimate an answer between 12 and 18 since 6×2 is 12 and 6×3 is 18. Another student might give an estimate of a little less than 15 because s/he figures the answer to be very close, but smaller than $6 \times 2\frac{1}{2}$ and thinks of 2 $\frac{1}{2}$ groups of 6 as 12 (2 groups of 6) + 3 ($\frac{1}{2}$ of a group of 6).

Checking for Understanding

A recipe for a cake requires 1.25 cups of milk, 0.40 cups of oil, and 0.75 cups of water. How much liquid is in the mixing bowl?

Possible responses: $1.25 + 0.40 + 0.75$

Student A

- I broke 1.25 into $1.00 + 0.20 + 0.05$
- I left 0.40 like it was.
- I broke 0.75 into $0.70 + 0.05$
- I combined my two 0.05s to get 0.10.
- I combined 0.20, 0.10, and 0.70 to get 1.0.
- I added the 1 whole from 1.25.
- I ended up with 2 whole and 4 tenths, which equals 2.40 cups.

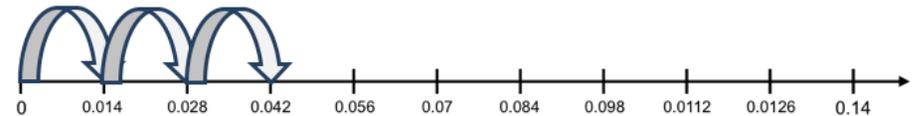
Student B

- I saw that the 0.25 in 1.25 and the 0.75 for water would combine to equal 1 whole.
- I then added the 2 wholes and the 0.40 to get 2.40.

You live 14 hundredths of a mile from your friends' house. After walking 3 tenths of the distance, you stop to talk to another friend. How much of a mile have you walked? (0.3×0.14)

Possible responses:

Number Line Model



The number line shows the distance marked off from 0 to 0.14 and that distance is partitioned into 10 equal segments. Each segment represents a distance of 0.014 or a tenth of 0.14. Three tenths is 0.014 plus 0.014 plus 0.014 which is 0.042.

Using the Distributive Property

$$0.3 \times 0.14 = 0.3 \times (0.1 + 0.04)$$

$$0.3 \times 0.1 = 0.03 \quad 0.3 \times 0.04 = 0.012$$

Perform Operations with decimals.

NC.5.NBT.7 Compute and solve real-world problems with multi-digit whole numbers and decimal numbers.

- Add and subtract decimals to thousandths using models, drawings or strategies based on place value.
- Multiply decimals with a product to thousandths using models, drawings, or strategies based on place value.
- Divide a whole number by a decimal and divide a decimal by a whole number, using repeated subtraction or area models. Decimals should be limited to hundredths.
- Use estimation strategies to assess reasonableness of answers.

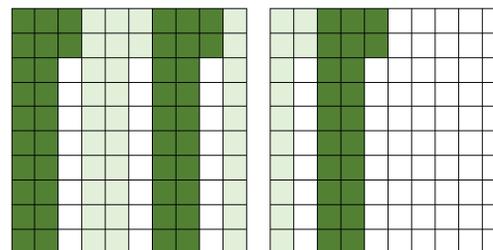
Clarification

Checking for Understanding

$$0.03 + 0.012 = 0.042 \text{ miles}$$

A gumball costs \$0.22. How much do 5 gumballs cost? Estimate the total, and then calculate. Was your estimate close?

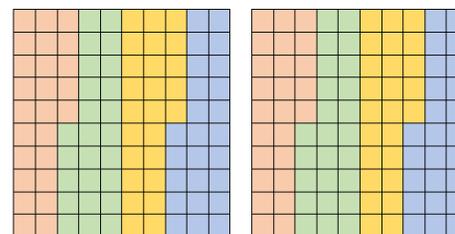
Possible response:



I estimate that the total cost will be a little more than a dollar because 5 20's equal 100 and I have 5 22's. I have 110 boxes shaded, which is one whole and one tenth. My answer is \$1.10.

Sarah makes 2 pounds of trail mix. How many bags will she need if she puts 0.25 pounds of mix in each bag?

Possible response:



I showed the two pounds of mix using decimal squares. Then, I colored in 25 squares to represent 25 hundredths. I continued to do that until all of the squares had been colored. Sarah will need 8 bags for her trail mix.

Return to [Standards](#)

Number and Operations—Fractions

Use equivalent fractions as a strategy to add and subtract fractions.

NC.5.NF.1 Add and subtract fractions, including mixed numbers, with unlike denominators using related fractions: halves, fourths and eighths; thirds, sixths, and twelfths; fifths, tenths, and hundredths.

- Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.
- Solve one-and two-step word problems in context using area and length models to develop the algorithm. Represent the word problem in an equation.

Clarification

While working on NC.5.NF.1 students should be able to estimate and find the answer to one- and two- step word problems involving fractions with unlike denominators using related fractions. Adding and subtracting only related fractions is new to 5th grade. Related fractions are fractions in which one denominator is a multiple of the other, e.g., halves, fourths, and eighths.

Students should be able to assess the reasonableness of answers by estimating sums and differences to the nearest half or whole number.

Students should have ample experiences creating area and length models to build understanding. The use of these models allows students to use reasonableness to find a common denominator prior to using the algorithm. For example, when adding $\frac{1}{3} + \frac{1}{6}$, Grade 5 students should apply their understanding of equivalent fractions and their ability to rewrite fractions in an equivalent form to find common denominators.

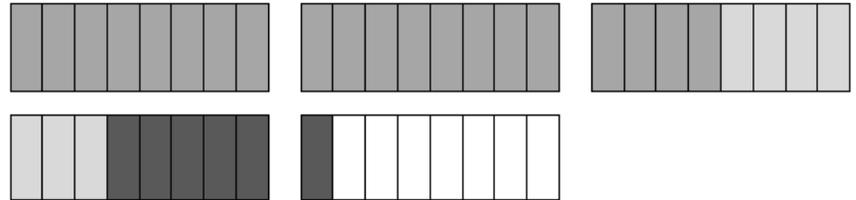
Checking for Understanding

There is some ham in the refrigerator. Tyrisha uses $\frac{3}{4}$ of a pound to make sandwiches and Jacquell uses $\frac{7}{8}$ of a pound to make sandwiches. If there is now $2\frac{1}{2}$ pounds of ham left over, how much ham was there before Tyrisha and Jacquell used some.

Possible responses:

Student 1:

We do not know what we started with but we know we ended with $2\frac{1}{2}$ pounds of ham. Before Jacquell took ham, there was $\frac{7}{8}$ of a pound more ham. I need to solve $2\frac{1}{2} + \frac{7}{8} + \frac{3}{4}$. I knew that since $\frac{7}{8}$ and $\frac{3}{4}$ were greater than a half but less than 1, that my total would be close to but less than 4 and $\frac{1}{2}$.



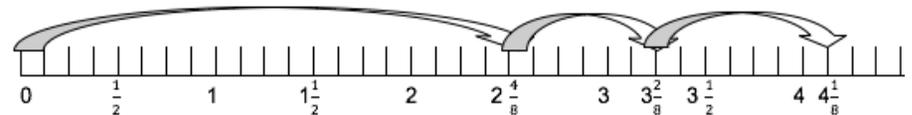
When I found the total amount shaded it was 4 and $\frac{1}{8}$, which is close to my estimate.

Student 2:

I know that $2\frac{1}{2}$ is the same as 2 and $\frac{4}{8}$. I also know that $\frac{3}{4}$ is $\frac{6}{8}$. So, I used the equation:

$$2\frac{4}{8} + \frac{6}{8} + \frac{7}{8}$$

I used the number line to jump from zero.



Return to [Standards](#)