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

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

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

Checking for Understanding

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	Student 2	Student 3
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.	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.	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	Student 2
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.	*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**
• Increase the whole number answer up one • Round to the nearest whole number for an approximate result	Write different word problems involving 44 ÷ 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 ÷ 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 ÷ 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 ÷ 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 ÷ 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 ÷ 6 = p; p =* ***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 ÷ 30 = b; b = 37 R 6; They will need 38 buses because 37 buses would not hold all of the students.*

Return to Standards

Generate and analyze patterns.
NC.4.OA.5 Generate and analyze a number or shape pattern that follows a given rule.

Clarification

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 multiple opportunities creating and extending number and shape patterns. This standard does not require students to infer or guess the underlying rule for a pattern, but rather asks them to generate a pattern from a given rule and identify features of the given pattern.

Patterns and rules are related. A pattern is a sequence that repeats the same process over and over. A rule dictates what that process will look like. Students investigate different patterns to find rules, identify features in the patterns, and justify the reason for those features.

This standard begins with a small focus on reasoning about a number or shape pattern, connecting a rule for a given pattern with its sequence of numbers or shapes. Patterns that consist of repeated sequences of shapes or growing sequences of designs would be appropriate for fourth grade.

Checking for Understanding

Ted and Nancy both mow lawns during the summer to earn money.
Ted charges $10 per lawn and $2 per hour.
Nancy charges $4 per lawn and $4 per hour.

Complete the table to show how much Ted and Nancy would each earn based on the amount of time that it took to mow a lawn.

	Ted	Nancy
½ hour		
1 hour		
1 and ½ hours		
2 hours		
2 and ½ hours		
3 hours		
3 and ½ hours		
4 hours		

There are 4 beans in the jar. Each day 3 beans are added. How many beans are in the jar for each of the first 5 days?

Day	Operation	Beans
0	3 x 0 + 4	4
1	3 x 1 + 4	7
2	3 x 2 + 4	10
3	3 x 3 + 4	13
4	3 x 4 + 4	16
5	3 x 5 + 4	19

Return to Standards

Understand concepts of angles and measure angles.

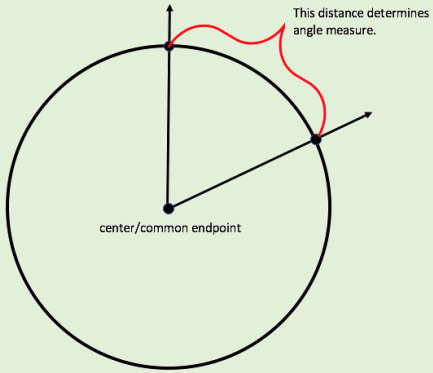
NC.4.MD.6 Develop an understanding of angles and angle measurement.

- Understand angles as geometric shapes that are formed wherever two rays share a common endpoint and are measured in degrees.
- Measure and sketch angles in whole-number degrees using a protractor.
- Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems.

Clarification

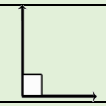
In this standard, students explore angles and their properties. An angle is formed by two rays that share an endpoint and is measured with reference to the degrees of a circle.

For example: If the common endpoint of two rays is the center of a circle, the angle can be measured by considering the fraction of the circular arc between the points where the rays intersect the circle.



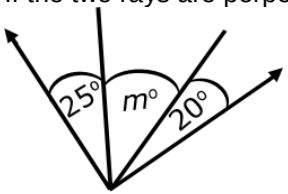
An angle that turns $\frac{1}{360}$ of a circle is a "one-degree angle".

Students will be able to identify three types of angles: right angle, acute angle, and obtuse angle

	**right angle:** An angle that equals one quarter of a full rotation of a circle, or 90º
	**acute angle:** An angle that is less than a right angle, or less than 90º
	**obtuse angle:** An angle that is more than a right angle, or more than 90º.
	**Straight angle:** An angle that is 180º

Checking for Understanding

If the two rays are perpendicular, what is the value of m?



A lawn water sprinkler rotates 65 degress and then pauses. It then rotates an additional 25 degrees. What is the total degree of the water sprinkler rotation?

To cover a full 360 degrees how many times will the water sprinkler need to be moved?

If the water sprinkler rotates a total of 25 degrees then pauses. How many 25 degree cycles will it go through for the rotation to reach at least 90 degrees?

Joey knows that when a clock's hands are exactly on 12 and 1, the angle formed by the clock's hands measures 30º. What is the measure of the angle formed when a clock's hands are exactly on the 12 and 4?

Understand concepts of angles and measure angles.

NC.4.MD.6 Develop an understanding of angles and angle measurement.

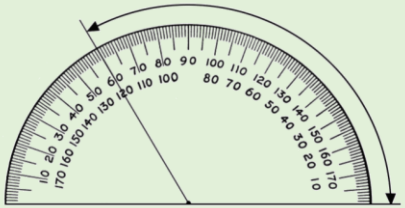
- Understand angles as geometric shapes that are formed wherever two rays share a common endpoint and are measured in degrees.
- Measure and sketch angles in whole-number degrees using a protractor.
- Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems.

Clarification	**Checking for Understanding**

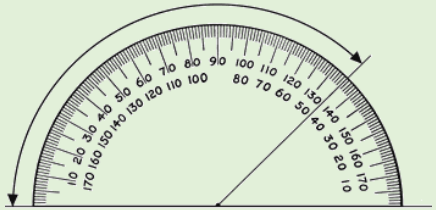
Students will learn to measure and sketch angles using a protractor. Students should also have an understanding of benchmark angles such as 45º, 90º and 180º.

For example:

When measuring angles with a protractor, students will first identify if the angle is acute or obtuse to determine which numbers to use. Acute angles would measure 0º to 89º, and obtuse angles would measure 91º to 179º. In this example, the angle is obtuse, so it would be read as 120º.



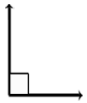
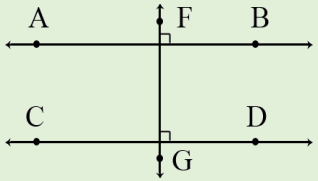
In the following example, the angle measured is obtuse, but facing the opposite direction of the angle pictured to the left. Students who understand that obtuse angles measure 91º to 179º would know that this angle measures 135º rather than 45º.



Students will understand that angle measure is additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Two angles are called *complementary* if their measurements have the sum of 90º. Two angles are called *supplementary* if their measurements have the sum of 180º. Two angles with the same vertex that share a side are called *adjacent angles*. These terms may come up in classroom discussion, but students are not responsible for knowing these terms by the end of the year. This concept is developed thoroughly in middle school (7th grade).

Return to Standards

Classify shapes based on lines and angles in two-dimensional figures.
NC.4.G.1 Draw and identify points, lines, line segments, rays, angles, and perpendicular and parallel lines.

Clarification	**Checking for Understanding**
This standard asks students to draw two-dimensional geometric objects and to also identify them in two-dimensional figures. Students should be able to draw and identify the following figures: point line segment line  ray  parallel lines  perpendicular lines  angle  right angle  acute angle  obtuse angle  straight angle  Students should understand the concept of parallel and perpendicular lines. Two lines are parallel if they never intersect and are always equidistant. Two lines are perpendicular if they intersect in right angles (90º). Lines AB and CD are parallel. Line FG is perpendicular to lines AB and CD forming right angles.  	Draw two different types of quadrilaterals that have two pairs of parallel sides? Is it possible to have an acute right triangle? Justify your reasoning using pictures and words. Draw and list the properties of a parallelogram. Draw and list the properties of a rectangle. How are your drawings and lists alike? How are they different? Be ready to share your thinking with the class. How many acute, obtuse and right angles are in this shape? Explain how you know. 

Return to Standards

Classify shapes based on lines and angles in two-dimensional figures.

NC.4.G.2 Classify quadrilaterals and triangles based on angle measure, side lengths, and the presence or absence of parallel or perpendicular lines.

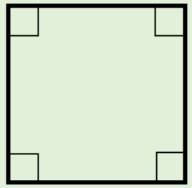
Clarification

This standard calls for students to sort quadrilaterals and triangles based on parallelism, perpendicularity, side lengths, and angle types.

Students should be able to use side length to classify triangles as equilateral, isosceles, or scalene; and can use angle size to classify them as acute, right, or obtuse. They then learn to cross-classify, for example, naming a shape as a right isosceles triangle.

Students should be able to use the relationship between sides and side lengths to classify quadrilaterals. Students' experiences with drawing and identifying right, acute, and obtuse angles support them in classifying two-dimensional figures based on specified angle measurements. They use the benchmark angles of 90°, 180°, and 360° to approximate the measurement of angles.

For example: The square has perpendicular lines because the sides meet at a corner, forming right angles. It also has parallel sides that are opposite from each other. I know this because if I changed the sides to lines that never end, the lines would never intersect and be the same distance apart. Segments are just parts of lines. All of the line segments are equal.

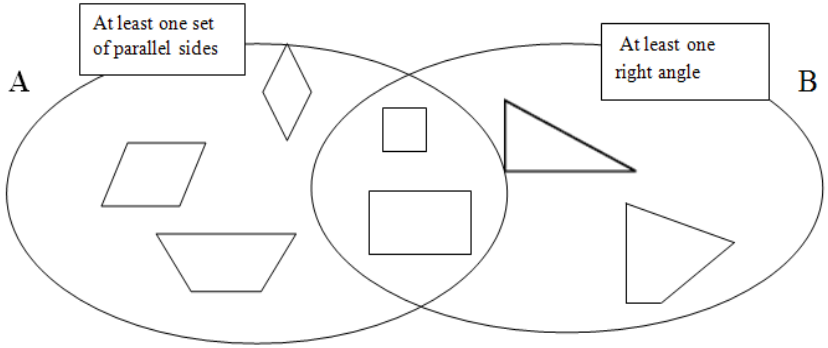


The notion of congruence ("same size and same shape") may be part of classroom conversation but the concepts of congruence and similarity do **not** appear until middle school.

Note: North Carolina has adopted the exclusive definition for a trapezoid. A trapezoid is a quadrilateral with *exactly* one pair of parallel sides.

Checking for Understanding

Which figure in the Venn diagram below is in the wrong place, explain how you know?

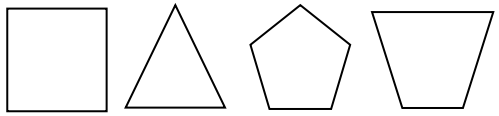


Do you agree with the label on each of the circles in the Venn diagram above? Describe why some shapes fall in the overlapping sections of the circles.

For each of the following, sketch an example if it is possible. If it is impossible, say so, and explain why or show a counter example.

- A parallelogram with exactly one right angle.
- An isosceles right triangle.
- A rectangle that is *not* a parallelogram. *(impossible)*
- Every square is a quadrilateral.
- Every trapezoid is a parallelogram.

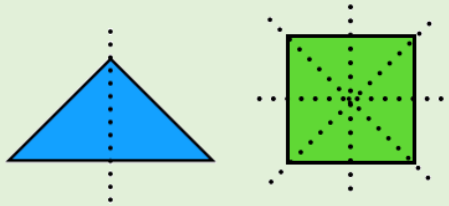
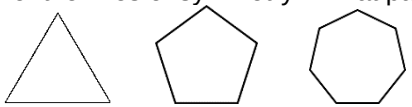
Identify which of these shapes have perpendicular or parallel sides and justify your selection.



Return to Standards

Classify shapes based on lines and angles in two-dimensional figures.

NC.4.G.3 Recognize symmetry in a two-dimensional figure, and identify and draw lines of symmetry.

Clarification	**Checking for Understanding**
In this standard, students determine if figures are symmetrical. Students should understand that if a figure can be folded or divided in half so the two halves mirror each other, the figure has line symmetry and the line of symmetry is the line that divides the figure. Students should be able to identify lines of symmetry in regular and non-regular polygons and understand that some figures may have more than one line of symmetry. This standard only includes line symmetry not rotational symmetry.  The triangle has one line of symmetry, and the square has four lines of symmetry.	For each figure, draw all of the lines of symmetry. What pattern do you notice?  How many lines of symmetry do you think there would be for regular polygons with 9 and 11 sides. Sketch each figure and check your predictions. *Polygons with an odd number of sides have lines of symmetry that go from a midpoint of a side through a vertex.*

Return to Standards