



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.

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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.

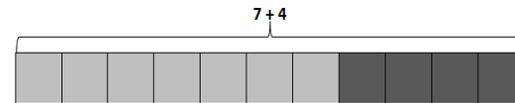
Checking for Understanding

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.

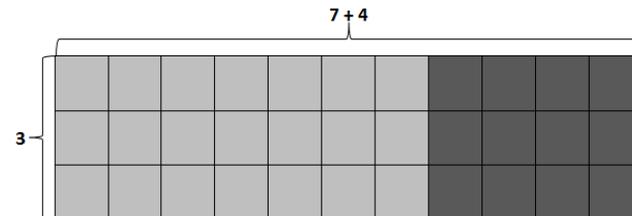
Adapted from Illustrative Mathematics (www.illustrativemathematics.org)

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) .

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Measurement and Data

Represent and interpret data.

NC.5.MD.2 Represent and interpret data.

- Collect data by asking a question that yields data that changes over time.
- Make and interpret a representation of data using a line graph.
- Determine whether a survey question will yield categorical or numerical data, or data that changes over time.

Clarification

In this standard, students will interact with data through data collection, creation of a line graph, and interpretation of data. Students have previously formulated survey questions that yield categorical or numerical data. In third grade, students collected data by asking a question that yielded categorical data, which is data that can be grouped into categories. Students in fourth grade learned to also ask questions that provide numerical data, which is data that is measurable such as time, height, weight, temperature, etc.

Checking for Understanding

Mrs. Smith's class wanted to track the daily low temperatures during the first 10 days in January. The data that the class collected is below.

- a. Graph the data on the chart.

January	Temp
1 st	4°
2 nd	16°

Represent and interpret data.**NC.5.MD.2** Represent and interpret data.

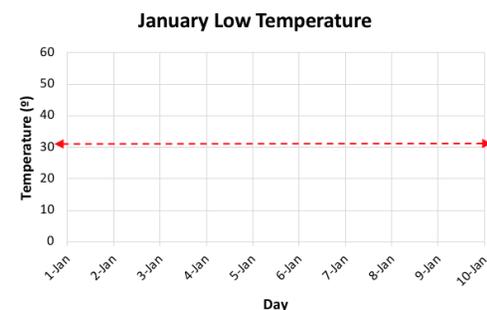
- Collect data by asking a question that yields data that changes over time.
- Make and interpret a representation of data using a line graph.
- Determine whether a survey question will yield categorical or numerical data, or data that changes over time.

Clarification

This standard calls for students to be able to formulate questions that provide them with data that changes over time. Once data is collected, students will be able to create a line graph to represent the data. Once graphs are created, students should be able to solve one and two-step problems using the information in the graphs.

Checking for Understanding

3 rd	29°
4 th	43°
5 th	41°
6 th	56°
7 th	29°
8 th	21°
9 th	17°
10 th	20°



- The dashed is the normal low. Approximately what was that temperature?
- When were the low temperatures above the normal low?
- What were the coldest 3 days?
- During the 10 days, how long was the temperature above normal?

Teacher: I am going to give you a cup of room temperature water. You are going to put 6 ice cubes in the cup. You are going to record the water temperature every 30 seconds for 5 minutes. After you collect the data you are going to make a line graph and then write 3 descriptive sentences about your data.

Write 2 survey questions. One should yield numerical data that can be represented on a bar graph. One should yield data that changes over time that can be represented on a line graph.

Possible responses:

Numerical data: *How many times does the pitcher strike out the batter in nine innings of baseball?*

Changes over time: *What is the average wind speed every day in April?*

Geometry

Understand the coordinate plane.

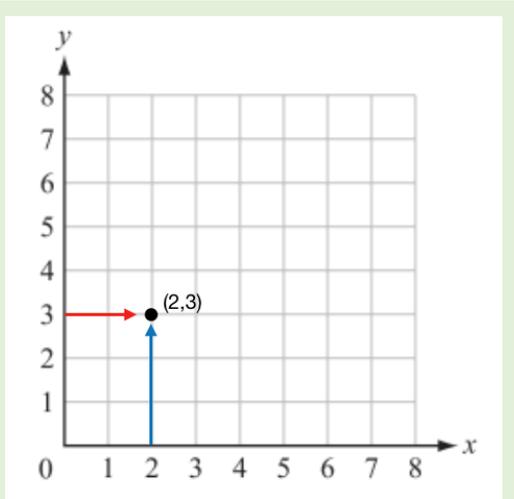
NC.5.G.1 Graph points in the first quadrant of a coordinate plane, and identify and interpret the x and y coordinates to solve problems.

Clarification

In this standard, students are introduced to the coordinate plane and learn to plot points in the first quadrant in order to solve real-world and mathematical problems. Problems include traveling from one point to another and identifying the coordinates of missing points in geometric figures, such as squares, rectangles, and parallelograms.

Students should understand that the coordinate plane is formed by a horizontal number line, called the x -axis, and a vertical number line, called the y -axis. The two axes intersect at a point called the origin $(0,0)$. Students need to understand coordinates define a distance from the y -axis and a distance from the x -axis.

Students should distinguish between two different ways of viewing the point $(2, 3)$. First, they should view the coordinates as instructions: "right 2, up 3". They should also understand the coordinates as the point defined by being a distance 2 from the y -axis and a distance 3 from the x -axis.



Checking for Understanding

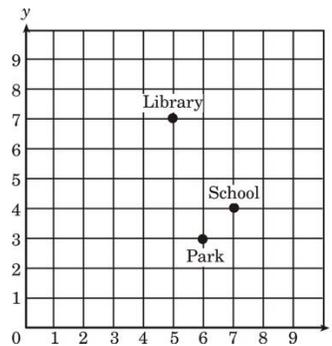
Plot these points on a coordinate grid.

Point A: $(2,6)$; Point B: $(4,6)$; Point C: $(6,3)$; Point D: $(2,3)$

Connect the points in order. Make sure to connect Point D back to Point A.

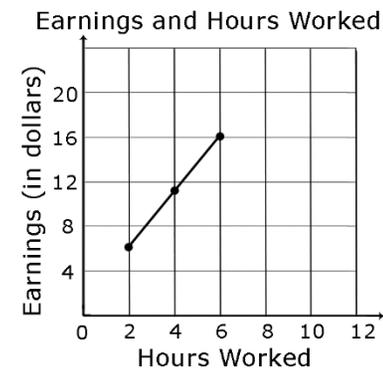
1. What geometric figure is formed? What attributes did you use to identify it?
2. What line segments in this figure are parallel?
3. What line segments in this figure are perpendicular?

(trapezoid, line segments AB and DC are parallel, segments AD and DC are perpendicular)



Using the coordinate grid, which ordered pair represents the location of the school? Explain a possible path from the school to the library.

Use the graph below to determine how much money Jack makes after working exactly 9 hours.



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