

Spring 2022 Math 3-5 Data Review Report

In fall 2022, the South Carolina Department of Education convened a panel of experts to review item data for the SC READY assessment. The panel looked at items and data from spring 2022 assessments. The discussions of this year's panel yielded the recommendations that follow. The panel recognizes the hard work of SC educators, particularly during the past three years, and offers these suggestions as an addendum to those from previous years.

The panel focused on reviewing field test items that did not perform well. Overall, the general feedback of the panel was consistent. Students should be using mathematical vocabulary as part of their everyday math instruction. Across all grade-levels, remember to use multiple representations to solve problems, utilize math talks, emphasize vocabulary, have students write out their thinking, and analyze the thinking of others.

The panel offered suggestions to impact instruction for the standards listed below. Please be reminded that this is not an inclusive list of all the standards on the assessment, but consideration for the standards where students appear to be having difficulty.

In Grade 3,

Standard 3.MDA.1- Use analog and digital clocks to determine and record time to the nearest minute, using a.m. and p.m.; measure time intervals in minutes; and solve problems involving addition and subtraction of time intervals within 60 minutes.

Panel Findings: Teachers should provide students with various real-world examples of elapsed time. Move beyond travel examples when asking students to explore elapsed time questions. Incorporate age-appropriate examples (completing homework, reading a book, scout meetings, various events that students may encounter whether it be related to music, sports, etc.). Vary the examples given to the students to include asking questions that give the time interval both with and without the visual. Also, include digital examples where time is represented in words. Instruct students with and without visuals of clocks (analog and digital) because students will experience items that do not include the clock. Provide instructional strategies that students can use to respond to items that do not include the clock. Encourage students to draw their own visuals and have experiences with concrete examples and materials.

Standard 3.MDA.6- Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

Panel Findings: Teachers should build student stamina and endurance for problem solving. Expose students to items with and without models. When students are not given models, encourage them to create their own. Teach mathematical vocabulary with fidelity so that students really understand the terms width, area, and perimeter. Pay attention to the wording in the standard to provide intense instruction between the differences between area and perimeter. Also,

give students opportunities to explore situations where they are given a shape and need to find a new shape with either the same area or perimeter.

Standard 3.NSBT.1- Use place value understanding to round whole numbers to the nearest 10 or 100.

Panel Findings: Place emphasis on the mathematical terms used when instructing this standard. Place emphasis on students understanding the math and not just saying phrases or singing songs for memorization of the steps. Students should be comfortable bringing their own number lines or visuals to support their rounding. Be mindful of the digits being used to round and have diversity in the digits that are being rounded. The panel is concerned that students predominantly see digits 4, 5, 6 during instruction, so be mindful to use all digits 0-9 when rounding. Support students with word walls and anchor charts that include math vocabulary. Be mindful that all students should have support with the vocabulary especially when new vocabulary is introduced. Be mindful to show students words like ten and hundred written in word form so that students are familiar with these words.

Standard 3.NSF.2.c- Explain fraction equivalence (i.e., denominators 2, 3, 4, 6, 8, 10) by demonstrating an understanding that: whole numbers can be written as fractions (e.g., $4 = \frac{4}{1}$ and $1 = \frac{4}{4}$)

Panel Findings: Place emphasis on the students' understanding of equivalence in fractions. Students should be flexible with numbers. Build students' understanding and ensure the number sense of fractions is strong. Spend time teaching students how to understand the different representation of numbers. Use a variety of models of to show the fractions that students are using ($\frac{4}{1}$ is four wholes, just as $\frac{4}{4}$ is $\frac{1}{4}$ 4 times to make one whole). Discuss and model the characteristics of a numerator and denominator. Use the mathematical terms such as numerator, denominator, fraction bar, etc. when describing fractions. Students should have a thorough understanding of the fraction to whole number concept. Provide multiple opportunities for students to have a deep dive of this standard with various activities and lessons centered around the understanding of fraction equivalency. Look at the fourth-grade standards to give students a reference point for where this is going in the future.

In Grade 4,

Standard 4.MDA.1- Convert measurements within a single system of measurement, customary (i.e., in., ft., yd., oz., lb., sec., min., hr.) or metric (i.e., cm, m, km, g, kg, mL, L) from a larger to a smaller unit.

Panel Findings: Students should be comfortable responding to questions both with and without the conversions given. Support students with converting the units listed within the standard. Make the connection for students between the metric system and place value when students are learning Number Sense and Base Ten Standards. Consider reviewing the skills taught during calendar time to give students context for the number of seconds in a minute, minutes in an hour, hours in a day, etc.

Standard 4.NSF.3.b- Develop an understanding of addition and subtraction of fractions (i.e., denominators 2, 3, 4, 5, 6, 8, 10, 12, 25, 100) based on unit fractions. a. Compose and decompose a fraction in more than one way, recording each composition and decomposition as an addition or subtraction equation; b. Add and subtract mixed numbers with like denominators; c. Solve real-world problems involving addition and subtraction of fractions referring to the same whole and having like denominators.

Panel Findings: Students are performing well when adding mixed numbers that do not involve regrouping.

Students should be taught how to regroup using models. Give students items without models to allow them the opportunity to bring their own models to the items. Students should be able to convert whole numbers to fractions.

Standard 4.ATO.4- Recognize that a whole number is a multiple of each of its factors. Find all factors for a whole number in the range 1 – 100 and determine whether the whole number is prime or composite.

Panel Findings: Use the mathematical vocabulary with students. Students should understand the term factors and how to apply that knowledge to this standard. Do not limit students to 10×10 when determining the factors of numbers within 100. Students should be able to identify all factors of a whole number within the range of 1-100. Do not assume that the factors will be less than 10 when instructing students on this standard. Increase students' stamina when factoring numbers so that they are able to identify all factors. The panel suggested using The Factor Rainbow to give students a visual of the factors for numbers. Consider teaching students the divisibility rules to support their understanding.

Standard 4.G.1- Draw points, lines, line segments, rays, angles (i.e., right, acute, obtuse), and parallel and perpendicular lines. Identify these in two-dimensional figures.

Panel Findings: Students should understand all vocabulary listed in the standard. Instruct students in a way that they can identify the listed terms in a variety of figures. Students can see multiple terms being used in a single shape. Also, provide variety with students so that shapes are turned in various directions. Additionally, perpendicular lines do not always have to cross to make a "t" shape.

Standard 4.G.2- Classify quadrilaterals based on the presence or absence of parallel or perpendicular lines.

Panel Findings: Students should understand the vocabulary within this standard. Teachers should incorporate characteristic charts and hierarchy diagrams to support student learning. Also, students should understand phrases like "at least _____".

Standard 4.NSBT.6- Divide up to a four-digit dividend by a one-digit divisor using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.

Panel Findings: Expose students to DOK 3 items for division. Students must know their math facts to be successful on this standard. The standard algorithm (long division) is not expected until Grade 6. Expose students to various models for division to ensure flexibility. Also, students need to understand the vocabulary words associated with division. Remember to explore the relationship between multiplication and division while using models. Students should be able to work backwards through division problems.

In Grade 5,

General Notes for Grade 5- This is the first-time students are exposed to multi-select items in math. These items ask students to select ALL for the correct answer options. Since there is no specific number indicated, students should know to select more than one option but less than all options. Teach students to reason through answer options with multi-select items to ensure they have selected the correct options. Use various numbers of correct keys for students so they don't get comfortable using one target number.

Standard 5.ATO.2- Translate verbal phrases into numerical expressions and interpret numerical expressions as verbal phrases.

Panel Findings: Students are successful solving items that involve one set of grouping symbols.

Make sure students understand how to use grouping symbols (parentheses, brackets, braces). Students should understand that evaluate does not necessarily mean that students need to solve. Order of Operations is not expected until Grade 6. Provide students phrases in text and have them write the numerical expression and vice versa. Remind students to be attentive to the symbols. Have students explore how to select the correct wording for a verbal phrase.

5.ATO.3.c.- Investigate the relationship between two numerical patterns. a. Generate two numerical patterns given two rules and organize in tables; b. Translate the two numerical patterns into two sets of ordered pairs; c. Graph the two sets of ordered pairs on the same coordinate plane; d. Identify the relationship between the two numerical patterns.

Panel Findings: Students are successful on items where the pattern is given to them.

Students should understand how terms are translated into ordered pairs. Use the word term with students when describing patterns. Students should be able to create a function table based on the rule and information that is given to them to determine a pattern. Teach students to read the question carefully to determine what is being asked and to ensure their understanding prior to solving.

Standard 5.G.1.d.- Define a coordinate system. a. The x- and y- axes are perpendicular number lines that intersect at 0 (the origin); b. Any point on the coordinate plane can be represented by its coordinates; c. The first number in an ordered pair is the x-coordinate and represents the horizontal distance from the origin; d. The second number in an ordered pair is the y-coordinate and represents the vertical distance from the origin.

Panel Findings: Students must understand the vocabulary listed within the standard. Move beyond simply naming the location of plotted points, but have students manipulate points to describe what they see in terms of vertical distance, horizontal distance, x-axis, and y-axis.

Standard 5.G.3- Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.

Panel Findings: Teach the hierarchy of shapes with fidelity. Student should be able to create the shapes when they are not given. Place emphasis on the difference between closed figures and open figures. Reinforce the names of shapes that were taught in previous grade-levels.

Standard 5.MDA.1- Convert measurements within a single system of measurement: customary (i.e., in., ft., yd., oz., lb., sec., min., hr.) or metric (i.e., mm, cm, m, km, g, kg, mL, L) from a larger to a smaller unit and a smaller to a larger unit.

Panel Findings: Implement hands-on experiences whenever possible to support all students with conversions. Connect conversions to the basic multiplication facts and place value.

Metric system- Students should understand relative size when talking about metric conversions. Incorporate decimals into problems when using metric conversions. Make sure students can identify the difference between decimals, commas, and their different uses.

Standard 5.MDA.3.c.- Understand the concept of volume measurement. a. Recognize volume as an attribute of right rectangular prisms; b. Relate volume measurement to the operations of multiplication and addition by packing right rectangular prisms and then counting the layers of standard unit cubes; **c. Determine the volume of right rectangular prisms using the formula derived from packing right rectangular prisms and counting the layers of standard unit cubes.**

Panel Findings: Students should understand that length, width, and height must be used to solve for volume. Remember to have students use unit cubes to solve for volume (don't skip this). Give students items with the prism shown but part of it is not shown and remind them to think through length, width, and height.

Standard 5.NSBT.1- Understand that, in a multi-digit whole number, a digit in one place represents 10 times what the same digit represents in the place to its right, and represents 1/10 times what the same digit represents in the place to its left.

Panel Findings: Teachers should diversify answer options for students. For example, use expressions in the answer options when asking about the underlined digit. Then have students determine which expression is equal to the underlined digit. Also, students should understand the value of digits.

Standard 5.NSF.5.c.- Justify the reasonableness of a product when multiplying with fractions. a. Estimate the size of the product based on the size of the two factors; b. Explain why multiplying a given number by a number greater than 1 (e.g., improper fractions, mixed numbers, whole

numbers) results in a product larger than the given number; c. Explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; d. Explain why multiplying the numerator and denominator by the same number has the same effect as multiplying the fraction by 1.

Panel Findings: Create models to multiply fractions. Students should understand the results of multiplying two fractions less than one together. Remember to avoid saying phrases like when you multiply two numbers together the product is larger because this statement is not true across all multiplication scenarios.

Standard 5.NSF.5.d.- Justify the reasonableness of a product when multiplying with fractions. a. Estimate the size of the product based on the size of the two factors; b. Explain why multiplying a given number by a number greater than 1 (e.g., improper fractions, mixed numbers, whole numbers) results in a product larger than the given number; c. Explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; d. Explain why multiplying the numerator and denominator by the same number has the same effect as multiplying the fraction by 1.

Panel Findings: Students should understand that a whole number is a fraction. Also, place emphasis on understanding the wording of the standard. Let students explore multiple representation of fractions ($2/2=1$).

Standard 5.NSF.6- Solve real-world problems involving multiplication of a fraction by a fraction, improper fraction and a mixed number

Panel Findings: Students should be able to use equivalent fractions to simplify their answers. Remember this standard references real-world problems, so teach every operation in context. Students should understand that multiplication and division are separate operations.