In October 2018 the South Carolina Department of Education convened a panel of experts to review item data on SC READY grades 3-5. The panel looked at items with a high percentage of students answering correctly and items with a low percentage of students answering correctly. The discussions of that panel yielded the recommendations that follow. Teachers on this year’s panel felt that last year’s suggestions were still extremely relevant and that teachers should be reminded to look at last year’s Data Review Report (2017). The panel recognizes the hard work of SC educators and offers these suggestions as an addendum to those from last year.

**General Suggestions:**

The following are general suggestions that arose for multiple items.

- Stress the use of correct mathematical vocabulary. Mathematics is a language. Correct use of mathematical vocabulary provides content consistency across grades. Compel students to use proper mathematical vocabulary when explaining and justifying their work. At early grades scaffold their responses or have them pick from a list. Insist on proper mathematical vocabulary during mathematical discussions.

- Mathematical discussions are a great tool to use with your students. This year the panel is encouraging teachers to use mathematical discussions to introduce error analysis and critiquing other students’ work. When critiquing work, the work does not need to be authentic. Use mathematical discussions as a way to explore the process standards with your students.

- Graph paper can be used as scratch paper. The panel this year wanted to remind teachers to use graph paper to help lining up numbers, and recreating tables and diagrams. In addition, the panel wanted to remind teachers that graph paper is an excellent tool for students when working on area or the area model.

- Practice story items and multi-step story items. Students still need help with multi-step story items. Give students tools and techniques for dealing with story items. Have students write out what is given and what they are finding. Have students draw a picture or recreate it if the picture is given. Be careful bolding and underlining too many words on your assessments.

- Practice the Online Tools Training (OTT). The OTT is there to minimize test day stress. The OTT familiarizes students with the mechanics of the test and the tools that are there to help them.

- Teachers should favor conceptual understanding over strictly teaching procedures. The panel recognizes the importance of procedural fluency. However, again this year it is clear that students are fluent in certain procedures, but do not understand the basic underlying principle. The panel wanted to emphasize teaching concepts, understanding, and drawing connections between seemingly disparate units.

- Offer practice answering multi-select items in fifth grade and above. The panel wanted to remind both teachers and students that multi-select items will have more than one correct answer and fewer than all correct answers.

- Push students to consider an answer’s reasonableness. The panel wanted to encourage using estimation as one way to consider the plausibility of answer choices.

- Continue practicing graphs and tables especially data displayed in tables. Students should be prepared to interpret grade level appropriate data displays.
Grade 3 Suggestions:
The following suggestions are specific to grade 3 items. They are organized by key concept.

General Suggestions for Grade 3:
- Continue teaching using number lines as a model and a tool.
- Students should be familiar with reading analog clocks. In addition, vary the graphics used when teaching reading analog clocks. For instance, some analog clocks have arrows others have line segments as hands.
- Teachers wanted to make sure that students are familiar with the following words in a mathematical context.
  - Each – this is used to describe distributing items
  - “equal” pieces – used when someone divides something among people
  - How many more – typically used in an addition item
  - Serve – as in serve cake
  - Least to greatest – or vice versa in terms of ordering numbers
  - Unit squares – as used in area items
  - Compares – looking at two quantities to draw a conclusion
  - Sorts – used to describe sorting into groups
  - Stayed, Left, and Finished – as used in an item about time

Number Sense and Base Ten (NSBT):
- 3.NSBT.4 – In this standard “read” means that a student should be able to translate into word form.
- 3.NSBT.5 – When comparing and ordering numbers this could be ordering a handful of numbers from least to greatest or vice versa. In addition, the list may be represented using the < and > symbols.

Number Sense – Fractions (NSF):
- 3.NSF.1.b – Encourage students to draw pictures when given word problems with fractions and label each piece with a unit fraction.
- 3.NSF.2 – When developing understanding of this standard stress common numerators and common denominators. Be sure to go beyond unit fractions with this standard; when comparing denominators make sure the numerator is something other than 1, though both the same number e.g. \( \frac{2}{5} \) and \( \frac{2}{7} \).
- 3.NSF.2.d – Items will ask students to compare fractions with like numerator or like denominator. Students may have to select an answer that includes some grade level appropriate justification. An item may assess comparing common numerators and common denominators in the same item. Teachers should practice comparing a set of up to five fractions.
Algebraic Thinking and Operations (ATO):

- 3.ATO.2 – Be sure to teach students what division looks like on a number line. Practice representing division on a number line by skip counting backwards or by repeated subtraction to find groups on a number line. When exhibiting division on a number line ensure that students complete the thinking on a number line. Teaches may use math fact to support the number line and vice versa.
- 3.ATO.3 – Students did well on multiplication story items with equal groups. Generally students did well on multiplication standards.
- 3.ATO.5 – Continue to use math vocabulary including previous year’s vocabulary. Include the associative, distributive, and commutative properties of multiplication.
- 3.ATO.8 – Encourage students to draw a picture or a tape diagram to build understanding. Use reading strategies when handling story items. Be sure the students read the item a few times and that they focus on the question the item is asking. Have students read the item and then list possible questions. On an exam, have students cover the question and read the item. After they think for a minute, then have them read the question.

Geometry (G):

- 3.G.2 – Ensure students see common shapes divided into both equal and unequal partitions. Have students recognize that while equal parts of identical wholes need not have the same shape, any whole subdivided is not necessarily subdivided into all equal parts. When choosing shapes look at a variety of ways to divide common shapes into equal partitions.

Measurement and Data Analysis (MDA):

- 3.MDA.1 – Students need practice using analog clocks to find time. Students should be able to find start time, end time, and elapsed time given appropriate information. The panel suggested teaching time multiple ways including using a number line, t chart, and counting in base 60.
- 3.MDA.5c – Encourage students to use graph paper as scratch paper. This could help students with area items. Have students practice drawing area items on graph paper so they are familiar with the process of recreating a picture on graph paper. Practice subdividing rectilinear polygons. Students can also practice the connections between the number of squares inside a quadrilateral and the side lengths this way.
- 3.MDA.6 – Practice matching pictures with words when exhibiting rectangles with the same perimeters and different area or vice versa. Students may be asked to find the missing side of a rectangle given the perimeter and one side. Ensure that students understand that perimeter is the distance around. In the case of a quadrilateral the panel suggested having students and teachers draw a picture and label all four side lengths.
Grade 4 Suggestions:
The following suggestions are specific to grade 4 items. They are organized by key concept.

General:
- Students did well on items that contained graphs, charts, and other displays, continue to practice various displays of mathematics and data in general.

Number Sense and Base Ten (NSBT):
- 4.NSBT.3 – When practicing estimation be sure to practice estimation of single numbers and also estimating the value of a set. When asked for the best estimate of a table we are often interested in the estimate of the sum rather than a sum of the estimates. Discussing this difference could be an excellent time for a mathematical discussion. Students could investigate final answers when estimating at various points of an item.
- 4.NSBT.5 – Students need to understand and explain the calculations of a multiplication item using area models, rectangular arrays, and equations.
- 4.NSBT.6 – Teachers on the panel thought that teaching divisibility rules would help with students’ number sense and ability to evaluate the results of division items.

Number Sense – Fractions (NSF):
- 4.NSF.2 – When comparing to a benchmark fraction of ½ give students two different ways to compare. Students may halve the denominator or double the numerator to compare to a benchmark fraction. In addition, teachers need to provide a strategy for comparing to a benchmark fraction when the denominator is odd.
- 4.NSF.2 – Encourage students to draw a picture or a number line when asked to compare fractions. This is particularly important when a model is not given. In addition, be sure students can compare fractions with like denominator or like numerators.
- 4.NSF.3.a – Continue to practice decomposing fractions.
- 4.NSF.3.c – Students should be able to represent fractions in multiple ways. Make sure students are reading the question and answering what is being asked. Expose students to multiple representations of equivalent fractions. Include representations where the shaded area of a model is what was left vs another where the shaded area is what was removed. Make sure that students understand what the picture is telling them.
- 4.NSF.7 – Ensure that students understand real world items involving timed performance. Typically in a timed event having a smaller number means you win. For instance, in golf, running or automobile races, swimming, bobsled, and other Olympic Games winners are determined this way. Have students come up with other similar games. One way to illustrate this is to use a number line for a race marks in order: 0, first place, second place, third place. Practice by putting times on the board and have students find the winner.
Algebraic Thinking and Operations (ATO):

- 4.ATO.1 – Be sure to draw a distinction between phrases that sound similar but have different meanings. For instance, “greater than” and “is greater than” are often confused. When translating from verbal to symbolic multiplicative comparisons or vice versa be aware of these subtleties. The panel thought the phrases, “times as many” and “is” needed extra emphasis. Further, students should have an understanding of the symmetric property of equality. The panel advocated that this is one of the multiple mathematical representations to which process standards refer. Finally, the panel wanted to note that this translation may arise from a story item.

- 4.ATO.3 – The panel wanted to stress that teachers explain and explicitly model how to solve multi-step story items. Encourage students to draw pictures and diagrams to solve problems in addition to other visual models. Give students a strategy to manage given information and a way to separate that from requested information.

- 4.ATO.5 – The panel wanted to mention that repeated growth patterns are patterns that follow a rule. In addition, encourage students to read the item and finish the correct pattern. Teachers should spend time on extending tables and patterns to identify later terms.

Geometry (G):

- 4.G.1 – The panel wanted to stress that the identification of the parts mentioned in the standard of two-dimensional figures may give rise to a group of visually dissimilar figures. For instance, a trapezoid and triangle may be in a group of “figures with obtuse angles.”

- 4.G.2 – The panel thought that teaching parallelogram before a rectangle was important in understanding the relationships among quadrilaterals.

- 4.G.4 – The panel recommended that teachers have students draw the figures given in the test booklet or computer screen and then fold the scratch paper in order to test the symmetry. Practice having students do this in class. In addition, practice symmetric shapes with lines that are not of symmetry, but do equally partition. Use this as an opportunity for a mathematical discussion that all equal partitions do not define a line of symmetry.

Measurement and Data Analysis (MDA):

- 4.MDA.1 – The panel suggested using anchor charts to help with conversions.

- 4.MDA.3 – Teacher should be sure that students understand the concepts and realistic uses of area. Be sure to connect these concepts back to multiplication.

- 4.MDA.6 – The panel suggested teaching angle measurement by using two points on the protractor. Then if the rays are lined up properly the subtrahend should be zero. The panel thought this may help students who have problems knowing which ray and which number to read.
• 4.MDA.5 – The panel thought that teacher should use clocks to show the relationship between clock angles and fractions. In addition, teachers should stress that an “X degree angle is made up of X 1° angles.” The panel suggested having students actually fold clocks to stress that a circle is 360°, a half circle is 180°, and so on. Another suggestion was to put degree measures on one side of the circle and a clock face on the other to help with these connections.

• 4.MDA.8 – There was some concern in the panel that in counting money students were actually being asked to add decimals to the thousandth, which is 5.NSBT.7. The panel came to the consensus that while one way to add money is to list the value of each group of coins as a decimal to the thousandths and add the list using a standard algorithm, that is not the intent of this standard. Students should be well versed in grouping coins by some number of cents (which may change by teacher or item) and then effectively adding whole numbers. To help with the strategy teachers suggested drawing pictures of coins and to scaffold.
Grade 5 Suggestions:
The following suggestions are specific to grade 5 items. They are organized by key concept.

General:
- The panel wanted to remind teachers to focus on expressions throughout the year. In particular translating from words to symbols and vice versa.
- The panel recognized an opportunity to teach ATO.3 and G.1 together. The panel felt that as much as possible standards should be connected to each other and taught together rather than in isolation based on reporting categories.

Number Sense and Base Ten (NSBT):
- 5.NSBT.2.b – The panel wanted to mention that exponents need to be practiced in application items too.
- 5.NSBT.3 – The panel wanted to remind teachers to practice writing expanded form with place value. For instance, 0.35 would be $3 \times \frac{1}{10} + 5 \times \frac{1}{100}$.
- 5.NSBT.7 – Teachers wanted to emphasize the equivalence of tenths and hundredths. For instance, knowing that 0.70 = 0.7. The panel wanted to emphasize place value concepts.
- 5.NSBT.7 – Show decimal operations concretely using base 10 blocks. Students should be able to interpret a product given in base 10 blocks. The panel recommended having students practice interpreting the product of decimals using base 10 language.

Number Sense – Fractions (NSF):
- 5.NSF.8 – Students need to deepen their conceptual understanding of fractions. Both the elementary and middle school panels recommended a hands-on activity. For instance, asking the question how many 1/3 scoops of rice can fit into a two cup bowl? Then having students actually perform the experiment to see that the quotient is not just the smallest answer choice. Teachers could then transition to a pictorial model. Finally, help students use a number line to help with multiplying and dividing fractions where necessary.

Algebraic Thinking and Operations (ATO):
- 5.ATO.1 – Students are doing well interpreting parentheses, braces, and brackets. Keep up the good work on this topic.
- 5.ATO.2 – The panel recommended reinforcing the terms sum, difference, product, and quotient when working with this standard.

Geometry (G):
- 5.G.3 – The panel recommended that teachers stress this hierarchical structure through pictures. In particular the panel recommended Venn diagrams and a tree to show inherited attributes.
- 5.G.4 – Similar to the previous recommendation, teachers recommended a graphic organizer to help with the hierarchy of quadrilaterals. Again the panel preferred a graphic organizer that that shows how properties are inherited. Also, instruct students on how to climb up and down the “quadrilateral tree.” Lastly, be sure to include both examples and non-examples of shapes containing attributes of interest.
**Measurement and Data Analysis (MDA):**

- **5.MDA.1** – The panel recommended that students convert to smallest unit first. Then have students perform the operations. If necessary then convert the answer back to the larger unit. The panel wanted to mention that there real-world conversion items with and without exponents. In addition, remember that at this grade be sure to convert both small to large and vice versa.

- **5.MDA.2** – Teacher wanted to emphasize practicing using data from a line plot. In addition, when teaching this standard teach simplifying fractions using equivalent fractions.

- **5.MDA.3.b** – The panel suggested that teachers expose students to items where different arrangements of the same number of unit cubes have the same volume.

- **5.MDA.4** – The panel recognized that students are missing the conceptual meaning of volume. Students are able to calculate volume when asked, but seem to miss on the interpretation of volume. Students need a wealth of examples of when they should measure using perimeter, area, and volume.