# GEORGIA'S K-12 MATHEMATICS STANDARDS 2021

# Summary of Changes

## *from March State Board Meeting to July State Board Meeting*

| K-12 Changes |
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| - The meaning of the term "real world problems" was clarified throughout the document.<br>- The evidence of student learning was enhanced based on public feedback to include more clarity.<br>- A Framework for Statistical Reasoning was added for all K-12 grade levels and courses. The framework illustrates and explains the statistical reasoning process as recommended by the GAISE II report.<br>- The standards coding structure was updated throughout the document to indicate the big idea for all standards. |
| **K-8 Changes** |
| - A one pager of the standards with a table that only shows the standards for each grade level was added to indicate the key competencies for the grade level.<br>- Added "age and developmentally appropriate" descriptors for all geometry standards.<br>- Data concepts were integrated into other big ideas and clarified in the Essential Instructional Guidance section of the document.<br>- Data and Statistical Reasoning standards were removed. |
| **K-5 Changes** |
| - The measurement reasoning big idea was changed to Measurement and Data Reasoning (MDR).<br>- Language clarity, as necessary, was provided based on public feedback.<br>- The Evidence of Student Learning was updated to add clarity throughout all grade levels. |
| **Kindergarten** |
| - Within the Progressions chart the first listed concept regarding place value was changed from "11-19" to "within 20".<br>- Removed learning objective: K.1.1 Given a number from 1 – 20, count out that many objects. The numbering of all subsequent learning objectives within that first standard were changed as a result.<br>- Clarification was added to the Evidence of Student Learning column based on public review feedback.<br>- K.1.2 Count up to 20 objects arranged in a line, a rectangle, or a circle, or up to objectives in a scattered is now listed as the 1st learning objective and has been updated to the following wording: Count up to 20 objects in a variety of structured arrangements and up to 10 objects in a scattered arrangement.<br>- Removed learning objective: K.4.3 Compare and order two numbers between 1 and 10 presented as written numerals.<br>- K.NR.5.1 Compose (put together) and decomposes (break apart) numbers up to 10 using objects and drawings was originally the 3rd learning objective. It was moved to the beginning of the standard to align better with the natural progression of learning.<br>- The meaning of "counting backwards" was clarified.<br>- Compare problem types from the addition and subtraction standard were removed.<br>- Start-unknown and change-unknown problem types for word or story problems were removed and the focus was limited to result-unknown problem types with word problems. |

| 1st grade |
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| - Removed Learning Objective 1.2.1. Relate counting to addition and subtraction.<br>- As a result of the removal of 1.2.1, 1.NR.2.1 Use a variety of strategies to solve addition and subtraction problems within 20 became the 1st listed learning objective.<br>- Removed partitioning with shading to focus on partitioning the whole shape into equal shares without shading.<br>- Hierarchical understanding of trapezoids was removed.<br>- Identify pennies, nickels, and dimes was removed and moved to Kindergarten.<br>- Removed classifying shapes by angles<br>- Half-dollars removed<br>- Focused elapsed time on using the number line ONLY |
| **2nd grade** |
| - 2.NR.2.3 – Removed the addition and subtraction of 3-digit numbers from the language of the learning objective. Limited expectation to subtracting up to two two-digit numbers and adding up to four two-digit numbers in the evidence of student learning.<br>- 2.MDR.5.2 - Meter sticks were removed as a standard measuring tool.<br>- 2.GSR.8.3 and 2.GSR.8.4 - Shading of partitions of rectangles removed.<br>- Removed as a learning objective: 2.7.5 Partition a rectangle into rows and columns of same size squares and count to find the total number of them.<br>- Measure the length of an object twice, using length units of different measurements; describe how the two measurements relate to the size of the unit chosen was removed.<br>- Understand the relative size of units in different systems of measurement was removed.<br>- Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object was removed.<br>- Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units was removed. |
| **3rd grade** |
| - 3.NR.1.3 The phrase, “within 1000” was changed to “up to 1000” for clarity.<br>- 3.MDR.5.4. Clarity was provided to indicate that conversions are not expected at this grade level.<br>- 3.6.3 Explore and investigate shape in different categories of polygons and recognize that these shapes may share attributes that can define a larger category was removed.<br>- Removed: Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole.<br>- Removed: Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.<br>- Removed: Partition shapes into parts with equal areas.<br>- Removed: Express the area of each part as a unit fraction of the whole.<br>- Removed: Elapsed time to the nearest minute. |

| 4th grade |
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| - 4.NR.1 – "compare decimal numbers to the hundredths place" was removed from the standard.<br>- 4.3.4 Identify composite numbers and prime numbers and explain the relationship was changed to 4.PAR.3.4 updated to Identify composite numbers and prime numbers and explain the relationship with factor pairs.<br>- 4.MDR.6.1 – The idea of equivalence was emphasized in the learning objective.<br>- Clarity was provided to indicate that conversions are not expected at this grade level.<br>- Removed: Apply and extend previous understandings of multiplication to multiply a fraction by a whole number e.g., by using a visual such as a number line or area model. |
| **5th grade** |
| - 5.GSR.8.3 The creation of a hierarchy for two-dimensional figures was removed.<br>- 5.GSR.8.4 - Memorizing the formula for volume of a right rectangular prism was removed.<br>- Removed: Multiply and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.<br>- Removed: Apply and extend previous understandings of multiplication to multiply a fraction by a fraction.<br>- Removed: Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. (multiplying fractions by fractions was removed)<br>- Removed: Interpret multiplication as scaling (resizing), by comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.<br>- Removed: Solve real world problems involving multiplication of fractions and mixed numbers. |
| **6th grade** |
| - Simple fractions were defined as fractions with denominators of 2, 4, 5, or 10.<br>- 6.GSR.4.3 – The scope of this learning objective was limited to fractions with a denominator of 2, 3, or 5 to ensure age and developmental appropriateness. Also, included language to specify that problems should not include volume displacement.<br>- Clarification was added to explain that histograms are a display for quantitative data, not categorical data.<br>- The formula for mean absolute deviation (MAD) was removed. Emphasis placed on students exploring the *conceptual idea* of MAD.<br>- When exploring mean absolute deviation, data sets are limited to no more than 10 data sets.<br>- Removed: Fluently divide multi-digit numbers. |
| **7th grade** |
| - 7.PAR.4.6 – In the Evidence of Student Learning column, clarification was added that students should explore similarity conceptually using tools.<br>- 7.GSR.5.1 Measure angles in whole non-standard units was added.<br>- 7.GSR.5.2 Measure angles in whole number degrees using a protractor was added.<br>- 7.GSR.5.7 - Language added to clarify that cross-sections are limited to horizontal and vertical slices.<br>- Removed: Explore various geometric shapes with given conditions.<br>- Removed: Focus on creating triangles from three measures of angles and/or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.<br>- Removed: Probability - compound events |

## 8th grade

- 8.PAR.4 - Inequalities was removed from the standard.
- The entire standard and associated learning objective 8.8 Establish facts between angle relations and generate valid arguments to defend facts established was removed.
- Removed: Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
- Removed: Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane
- Removed: Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
- Removed: Verify experimentally the congruence properties of rotations, reflections, and translations: lines are taken to lines and line segments to line segments of the same length; angles are taken to angles of the same measure; parallel lines are taken to parallel lines.
- All geometric transformation concepts were removed and moved to HS Geometry
- Removed: Concept of analyzing data using two-way tables

## Algebra: Concepts and Connections

- A.FGR.2 – Added emphasis on the use of technology to explore various graphs.
- Changes to GSR.3: A.31 was changed from “Use the undefined notions of point, line, line segment, plane, and distance along a line segment to develop and use precise definitions and symbolic notations to Solve problems involving slope, area, and perimeter.” To A.GSR.3.1 – Solve real-life problems involving slope, parallel lines, perpendicular lines, area, and perimeter.
- A.3.2 was changed from “Derive the distance formula; Apply the distance formula, midpoint formula, and slope of line segments. Classify quadrilaterals in the coordinate plane; calculate the area and perimeter of special parallelograms and triangles with simple unknown side lengths.” to A.GSR.3.2 – Apply the distance formula, midpoint formula, and slope of line segments to solve real-world problems.
- A.PAR.6 – Language added to clarify that polynomial operations are included within the expectation of this standard. It is specified that polynomial sums, differences, and products should not exceed a maximum degree of 2.
- A.10.1 – Removed as a learning objective. “Represent data with plots on the real number line (dot plots, histograms, and box plots) by hand and using technology.”
- Removed the expectation for students to memorize the formula for standard deviation and to calculate the standard deviation by hand.
- Removed: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- Removed: Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations.
- Removed: Solve linear equations and inequalities in one variable including equations with coefficients represented by letters.
- Removed: Solving systems of linear equations.
- Removed: Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- Removed: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies).

## Geometry: Concepts and Connections

- G.GSR.4. – "Establish facts between angle relations and generate valid arguments to defend facts established." Added to the beginning of the language of the standard.
- G.GSR.4.2. – Added learning objective. "Classify quadrilaterals in the coordinate plane by proving simple geometric theorems algebraically."
- G.GSR.4.5 – Added learning objective. "Use geometric reasoning to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles."
- G.GSR.7 – Added standard. "Explore the concept of a radian measure and special right triangles."
- G.GSR.7.1 – Added learning objective. "Explore and interpret a radian as the ratio of the arc length to the radius of a circle."
- G.GSR.7.2 – Added learning objective. "Explore and explain the relationship between radian measures and degree measures and convert fluently between degree and radian measures."
- G.GSR.7.3 – Added learning objective. "Use special right triangles on the unit circle to determine the values of sine, cosine, and tangent for 30° ( $\pi/6$), 45° ( $\pi/4$) and 60° ( $\pi/3$) angle measures. Use reflections of triangles to determine reference angles and identify coordinate values in all four quadrants of the coordinate plane."
- G.PR.10 – Added standard. "Solve problems involving the probability of compound events to make informed decisions; interpret expected value and measures of variability to analyze probability distributions."
- G.PR.10.1 – Added learning objective. "Describe categories of events as subsets of a sample space using unions, intersections, or complements of other events. Apply the Addition Rule conceptually, P(A or B)= P(A) + P(B)-P(A and B), and interpret the answers in context."
- G.PR.10.2 – Added learning objective. "Apply and interpret the general Multiplication Rule conceptually to independent events of a sample space, P(A and B) = [P(A)]x[P(B|A)] =[P(B)]x[P(A|B)] using contingency tables or tree diagrams."
- G.PR.10.3 – Added learning objective. "Use conditional probability to interpret risk in terms of decision-making and investigate questions such as those involving false positives or false negatives from screening tests."
- G.PR.10.4 – Added learning objective. "Define permutations and combinations and apply this understanding to compute probabilities of compound events and solve meaningful problems."
- G.PR.10.5 – Added learning objective. "Interpret the probability distribution for a given random variable and interpret the expected value."
- G.PR.10.6 – Added learning objective. "Develop a probability distribution for variables of interest using theoretical and empirical (observed) probabilities and calculate and interpret the expected value."
- G.PR.10.7 – Added learning objective. "Calculate the expected value of a random variable and interpret it as the mean of a given probability distribution."
- G.PR.10.8 – Added learning objective. "Compare the payoff values associated with the probability distribution for a random variable and make informed decisions based on expected value and measures of variability."

## Advanced Algebra: Concepts and Connections

- AA.3 – Removed standard and all related learning objectives. "Solve problems involving the probability of compound events to make informed decisions; interpret expected value and measures of variability to analyze probability distributions."
- AA.GSR.7 – Removed "Explore the concept of a radian measure".
- AA.8.1 – Removed learning objective. "Explore and interpret a radian as the ratio of the arc length to the radius of a circle."

- AA.8.2 – Removed learning objective. “Explore and explain the relationship between radian measures and degree measures and convert fluently between degree and radian measures.”
- AA.8.3 – Removed learning objective. “Use special right triangles on the unit circle to determine the values of sine, cosine, and tangent for 30° ( π/6), 45° ( π/4) and 60° ( π/3) angle measures. Use reflections of triangles to determine reference angles and identify coordinate values in all four quadrants of the coordinate plane.”
- Removed piecewise-defined functions
- Removed: Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.
- Removed: Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations.
- Removed composition of functions
- Removed: Summarize, represent, and interpret data on a single count or measurement variable.
- Removed: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, mean absolute deviation, standard deviation) of two or more different data sets.

**4th math courses**

- Formatting of documents updated to landscape presentation.
- The standards coding structure was updated throughout the document to indicate the big idea for all standards.
- Updated terminology based on public feedback.