GEORGIA'S K-12 MATHEMATICS STANDARDS 2021

Governor Kemp and Superintendent Woods are committed to the best set of academic standards for Georgia's students – laying a strong foundation of the fundamentals, ensuring age- and developmentally appropriate concepts and content, providing instructional supports to set our teachers up for success, protecting and affirming local control and flexibility regarding the use of mathematical strategies and methods, and preparing students for life. These Georgia-owned and Georgia-grown standards leverage the insight, expertise, experience, and efforts of thousands of Georgians to deliver the very best educational experience for Georgia's 1.7 million students.

In August 2019, Governor Brian Kemp and State School Superintendent Richard Woods announced the review and revision of Georgia's K-12 mathematics standards. Georgians have been engaged throughout the standards review and revision process through public surveys and working groups. In addition to educator working groups, surveys, and the Academic Review Committee, Governor Kemp announced a new way for Georgians to provide input on the standards: the Citizens Review Committee, a group composed of students, parents, business and community leaders, and concerned citizens from across the state. Together, these efforts were undertaken to ensure Georgians will have buy-in and faith in the process and product.

The Citizens Review Committee provided a charge and recommendations to the working groups of educators who came together to craft the standards, ensuring the result would be usable and friendly for parents and students in addition to educators. More than 14,000 Georgians participated in the state's public survey from July through September 2019, providing additional feedback for educators to review. The process of writing the standards involved more than 200 mathematics educators -- from beginning to veteran teachers, representing rural, suburban, and metro areas of our state.

Grade-level teams of mathematics teachers engaged in deep discussions; analyzed stakeholder feedback; reviewed every single standard, concept, and skill; and provided draft recommendations. To support fellow mathematics teachers, they also developed learning progressions to show when key concepts were introduced and how they progressed across grade levels, provided examples, and defined age/developmentally appropriate expectations.

These teachers reinforced that strategies and methods for solving mathematical problems are classroom decisions -- not state decisions -- and should be made with the best interest of the individual child in mind. These recommended revisions have been shared with the Academic Review Committee, which is composed of postsecondary partners, age/development experts, and business leaders, as well as the Citizens Review Committee, for final input and feedback.

Based on the recommendation of Superintendent Woods, the State Board of Education will vote to post the draft K-12 mathematics standards for public comment. Following public comment, the standards will be recommended for adoption, followed by a year of teacher training and professional learning prior to implementation.

Use of Mathematical Strategies and Methods & Affirming Local Control

These standards preserve and affirm local control and flexibility regarding the use of the "standard algorithm" and other mathematical strategies and methods. Students have the right to use any strategy that produces accurate computations, makes sense, and is appropriate for their level of understanding.

Therefore, the wording of these standards allows for the "standard algorithm" as well as other cognitive strategies deemed developmentally appropriate for each grade level. Revised state tests will not measure the students' use of specific mathematical strategies and methods, only whether students understand the key mathematical skills and concepts in these standards.

Teachers are afforded the flexibility to support the individual needs of their students. It is critical that teachers and parents remain partners to help each child grow to become a mathematically literate citizen.

Georgia's K-12 Mathematics Standards - 2021
Mathematics Big Ideas and Learning Progressions, K-5

Mathematics Big Ideas, K-5

K	1	2	3	4	5
MATHEMATICAL PRACTICES & MODELING					
DATA & STATISTICAL REASONING					
NUMERICAL REASONING (NR)					
PATTERNING & ALGEBRAIC REASONING (PAR)					
GEOMETRIC & SPATIAL REASONING (GSR)					
MEASUREMENT & DATA REASONING (MDR)					

K-5 MATHEMATICS: LEARNING PROGRESSIONS

Key Concepts	K	1	2	3	4	5
NUMERICAL REASONING						
Numbers (whole numbers, fractions, and decimal numbers)	• Whole numbers to 100	• Whole numbers to 120 • Partition shapes into halves and quarters/fourths (fourths) with no shading	• Whole numbers to 1000 • Partition shapes into halves, thirds and quarters (fourths) with no shading	• Whole numbers to 10,000 • Unit fractions with denominators of 2, 3, 4, 6, and 8 • Represent fractions • Equivalence of simple fractions • Introduce shading to identify and compare fractional parts	• Whole numbers to 100,000 • Non-unit fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100 • Fractions with like denominators • Decimal fractions (tenths and hundredths)	• Multi-digit whole numbers • Fractions with unlike denominators • Fractions greater than 1 • Decimal fractions to thousandths
Counting	• Counting forward to 100 • Counting backward from 20 • Counting objects to 20	• Counting forward and backward within 120 • Skip counting by 2s, 5s, and 10s • Counting objects to 120	• Counting forward and backward within 1000 • Skip counting by 2s, 5s, 10s, 25s, and 100s • Counting objects to 1000	• Counting unit fractions	• Counting non-unit fractions	• Counting decimal numbers
Place Value	• Compose and decompose numbers within 20 • Identify and write numerals to 20	• Compose and decompose 2-digit numbers	• Hundreds, tens and ones in 3-digit numbers	• Round numbers to 1000 to nearest 10 or 100 • Read & write multi-digit whole numbers to thousands	• Magnitude of place value • Multi-digit whole numbers to 100,000 • Round multi-digit whole numbers • Fractions with • denominators of 10 or 100	• Magnitude of place value extended to decimal numbers • Powers of 10 to 10^3 • Read & write decimal numbers to thousandths place • Round decimal numbers to hundredths place
Comparisons	• Comparing objects up to 10 • Comparing numbers of objects in a set from 1-10	• Comparing numbers to 100	• Comparing numbers to 1,000	• Comparing numbers to 10,000 • Unit fractions	• Multi-digit numbers • Fractions less than 1 • Decimal fractions to hundredths place	• Decimal fractions to thousandths place • Fractions greater than 1
Computational Fluency	• Fluency with addition and subtraction within 5	• Fluency with addition and subtraction within 10	• Fluency using mental math up to 20 • Fluency with strategies within 100	• Fluency with multiplication and division with single-digit numbers • Fluency with addition and subtraction within 1,000	• Fluency with addition and subtraction with multi-digit whole numbers	• Fluency with multiplication and division with multi-digit whole numbers
Addition & Subtraction	• Single-digit numbers within 10	• Within 20 (using properties of operations) • Within 100 (using base ten understanding)	• Within 1,000 (using tools and strategies)	• Within 10,000	• Within 100,000 • Fractions with like denominators	• Fractions with unlike denominators • Decimal fractions to the hundredths place
Multiplication & Division			• Building arrays	• Within 100 • Multiply by multiples of 10	• Factors and multiples • Prime and composite numbers • Multiply by multi-digit whole numbers • Divide by 1-digit divisors	• Multiply multi-digit whole numbers • Multiply fractions and whole numbers • Divide unit fractions and whole numbers • Reason about multiplying by a fraction >, <, or = 1
Expressions						• Simple numerical expressions involving whole numbers with or without grouping symbols • Express fractions as division problems

K-5 MATHEMATICS: LEARNING PROGRESSIONS

Key Concepts	K	1	2	3	4	5
PATTERNING & ALGEBRAIC REASONING						
Patterns	• Repeating patterns with numbers and shapes • Explain the rationale for the pattern.	• Growing and repeating patterns of 1s, 5s, and 10s • Repeated operations, shapes or numbers	• Numerical patterns involving addition and subtraction	• Numerical patterns related to multiplication • Make predictions based on patterns	• Generate number and shape patterns that follow a rule • Represent and describe patterns	• Generate two numerical patterns using a given rule • Identify relationships using a table
Graphing						• Plot order pairs in first quadrant
GEOMETRIC & SPATIAL REASONING						
Shapes and Properties	• Identify, sort, classify, analyze, and compare 2D & 3D based on attributes using informal language • Positional words	• Identify, sort, and classify 2D & 3D shapes based on specific attributes using formal language and geometric properties • Compose 2D shapes & 3D shapes	• Describe, compare and sort 2-D and 3-D shapes given a set of attributes • Identify lines of symmetry in everyday objects	• Quadrilaterals • Parallel & perpendicular line segments, points, lines, line segments, & right angles and presence or absence of these in quadrilaterals • Lines of symmetry with quadrilaterals	• Points, lines, line segments, rays, angles, and parallel & perpendicular line segments • Classify, compare, & contrast polygons based on presence or absence of parallel or perpendicular line segments, angles of a specified size or side lengths.	• Classify polygons based on geometric properties • Relationships between categories and subcategories of shapes
Geometric Measurement				• Area of rectangles • Perimeter of rectangles	• Area and perimeter of composite rectangles • Angle measurement	• Volume of right rectangular prisms
MEASUREMENT & DATA REASONING						
Measurement & Data	• Measurable attributes of length, height, width and weight • Classify and sort up to 10 objects by attributes • Display and interpret categorical data with up to 10 data points on graphs	• Measure length in non-standard units • Compare, describe and order up to 3 objects using length in non-standard units • Display and interpret categorical data (with up to 3 categories)	• Measure length to nearest whole unit • Use tools such as constructed rulers and standard rulers • Choose units (in, ft, yd) appropriately • Display and interpret categorical data (with up to 4 categories)	• Measure liquid volume, length and mass in customary units • Use rulers to measure lengths in halves and fourths of an inch • Analyze numerical and categorical data with whole number values	• Measure liquid volume, distance, and mass using the metric measurement system • Use rulers to measure lengths to nearest $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$ of an inch • Analyze data using dot plots (with values to the nearest 1/8 of a unit)	• Measure length and weight in metric units • Convert between units of measurement • Create and analyze dot plots (line plots) with fraction measurements
Money	• Identify pennies, nickels and dimes and know the value of each coin	• Identify value of pennies, nickels, dimes and quarters	• Combination of coins • Problems involving dollars and all coins	• Using money to solve problems	• Using money as a tool or manipulative to solve problems	• Using money as a tool to solve problems involving decimals
Time		• Tell & write time in hours and half hours • Measure elapsed time to the hour	• Time to the nearest five minutes • Distinguish between a.m. & p.m. • Elapsed time to hour or half hour	• Tell time to the nearest minute • Estimate relative time • Elapsed time to hour, half hour & quarter hour	• Intervals of time • Elapsed time to the nearest minute	• Solving problems involving time

5th Grade

The nine standards listed below are the key content competencies students will be expected to master in fifth grade. Additional clarity and details are provided through the classroom-level learning objectives and evidence of student learning details for each grade-level standard found on subsequent pages of this document. As teachers are planning instruction and assessing mastery of the content at the grade level, the focus should remain on the key competencies listed in the table below.

FIFTH GRADE STANDARDS
5.MP: **Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.**
5.NR.1: **Use place value understanding to solve real-life, mathematical problems.**
5.NR.2: **Multiply and divide multi-digit whole numbers to solve relevant, mathematical problems.**
5.NR.3: **Describe fractions and perform operations with fractions to solve relevant, mathematical problems using part-whole strategies and visual models.**
5.NR.4: **Read, write, and compare decimal numbers to the thousandths place, and round and perform operations with decimal numbers to the hundredths place to solve relevant, mathematical problems.**
5.NR.5: **Write, interpret, and evaluate numerical expressions within authentic problems.**
5.PAR.6: **Solve relevant problems by creating and analyzing numerical patterns using the given rule(s).**
5.MDR.7: **Solve problems involving customary measurements, metric measurements, and time and analyze graphical displays of data to answer relevant questions.**
5.GSR.8: **Examine properties of polygons and rectangular prisms, classify polygons by their properties, and discover volume of right rectangular prisms.**

Georgia's K-12 Mathematics Standards – 2021

5th Grade

NUMERICAL REASONING *– place value, multiplying by powers of 10, multiplication and division of multi-digit numbers, fractions, decimal numbers, numerical expressions*

5.NR.1: Use place value understanding to solve real-life, mathematical problems.

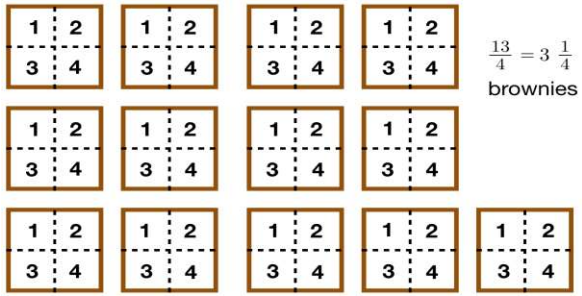
Expectations		Evidence of Student Learning (not all inclusive; see Grade Level Overview for more details)	
5.NR.1.1	Explain that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.	***Fundamentals*** • Students should identify the value of a digit up 100 times greater or $\frac{1}{1000}$ of the value of a digit.	***Examples*** • Mara has a digital scale. He placed one playing card on the scale and it read 1.3 grams. How much would you expect 10 playing cards to weigh? • Chris took the cards off the scale and then placed 10 pennies on the scale and the scale read 24 grams. How much would you expect one penny to weigh?
5.NR.1.2	Explain patterns in the placement of digits when multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10, up to 10^3.	***Fundamentals*** • Students should explain what happens to the value of a digit as it shifts to the left or right and discover the decimal point remains between the ones and tenths place as the digits shift. • Use whole-number exponents to denote powers of 10, up to 10^3.	

5.NR.2: Multiply and divide multi-digit whole numbers to solve relevant, mathematical problems.

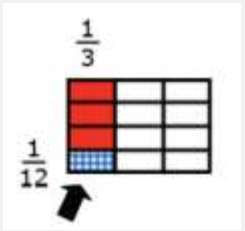
Expectations		Evidence of Student Learning (not all inclusive; see Grade Level Overview for more details)	
5.NR.2.1	Fluently multiply multi-digit (up to 3-digit by 2-digit) whole numbers to solve authentic problems.	***Strategies and Methods*** *– see special note in appendix* • Students should be presented with realistic situations involving multiplication of multi-digit whole numbers. • Students should fluently (flexibly, accurately, and efficiently) multiply to solve practical, mathematical problems using efficient strategies that are based on knowledge of place value and properties of operations. • Relevant problems can include word problems that are meaningful to a student's real environment. It is important for the problems presented to be relevant and interesting for the learners to pique their natural, intellectual curiosity. • Examples of different strategies and representations can be found within the *Computational Strategies for Whole Numbers* document found in the appendices.	***Age/Developmentally Appropriate*** • Students may use but are not limited to partial products (area model). • Students may also use a standard algorithm by making connections from previous part-whole strategies. • Students should choose a strategy that makes sense to them based on the problem. The focus should always be on efficiency.

5.NR.2.2	Fluently divide multi-digit whole numbers (up to 4-digit dividends and 2-digit divisors no greater than 25) to solve practical problems.	***Strategies and Methods*** – *see special note in appendix* • Students should be presented with realistic situations involving the division of multi-digit whole numbers. • Students should be able to explain partial quotients prior to beginning to use a more formal algorithm. • Students should fluently (flexibly, accurately, and efficiently) divide, to solve practical, mathematical problems using an efficient algorithm and flexible strategies, based on knowledge of place value and properties of operations. • Examples of different strategies and representations can be found within the *Computational Strategies for Whole Numbers* document found in the appendices.	***Age/Developmentally Appropriate*** • Students should divide multi-digit whole numbers up to 4-digit dividends and 2-digit divisors no greater than 25. • Students may use but are not limited to partial quotients (area model). • Students should choose a strategy that makes sense to them based on the problem and/or the numbers involved. The focus should always be on efficiency.

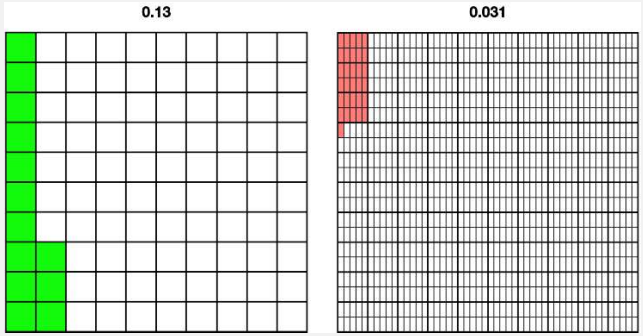
5.NR.3: Describe fractions and perform operations with fractions to solve relevant, mathematical problems using part-whole strategies and visual models.

Expectations		**Evidence of Student Learning** **(not all inclusive; see Grade Level Overview for more details)**		
5.NR.3.1	Explain the meaning of a fraction as division of the numerator by the denominator ($\frac{a}{b} = a \div b$). Solve problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers.	***Example*** • Four children want to share 13 brownies so each child gets the same amount. How many does each child get? Possible solution:  		
5.NR.3.2	Compare and order up to three fractions with different numerators and/or different denominators by flexibly using a variety of tools and strategies.	***Fundamentals*** • Tools and strategies could include visual fraction models, create common denominators or numerators, or compare to benchmarks such as 0, 1 and 2. • Students should compare all types of fractions, including fractions greater than one.	***Strategies and Methods*** • Students should use familiar tools such as number lines fraction pieces, and other manipulatives to solve comparing and ordering fractions problems. • Students should be given the opportunity to choose strategies based on the mathematical context and/or the numbers in the problem	***Examples*** • Two customers ordered pizzas. Jamie ordered a small, and Zach ordered a large. Jamie ate $\frac{3}{4}$ of her pizza. Zach at half of his. Who ate more pizza? Since the two pizzas were different sizes, we are unable to determine who ate more without more information. • Luke, Ella, and Janice were all given the same amount of money for their birthdays. Luke spent $\frac{3}{5}$ of his money, Ella spent $\frac{5}{8}$ of her money and Janice spent $\frac{3}{8}$ of her money. Who spent the most of their money? Who spent the least?

			to compare and order fractions. ● Students may choose strategies such as common-numerator, common denominator, using benchmark fractions, and equivalent fractions to compare and order fractions. ● Students should record the results of comparisons with symbols >, =, or <, and justify the conclusions. ● Students should be able to recognize that comparisons are valid only when the two fractions refer to the same whole.	*Possible student response:* "I know that $\frac{5}{8}$ is bigger than $\frac{3}{8}$ because they're both eighths and 5 is of something is more than 3. $\frac{3}{5}$ is also bigger than $\frac{3}{8}$ because fifths are bigger than eighths and there are three of each. $\frac{5}{8}$ is just a little bigger than $\frac{3}{5}$ because $\frac{15}{24}$ is just a little bigger than $\frac{15}{25}$. So, Janice spent the least, Ella spent the most, and Luke spent almost as much as Ella, but not quite."
5.NR.3.3	Model and solve problems involving addition and subtraction of fractions and mixed numbers with unlike denominators.	***Fundamentals*** ● Students should use benchmark fractions and number sense of fractions to estimate and assess the reasonableness of answers as an introduction to addition and subtraction.	***Strategies and Methods*** ● Students should use numerical reasoning to add and subtract fractions and mixed numbers with unlike denominators in authentic, mathematical problems by finding a common denominator and equivalent fractions to produce like denominators using a variety of tools and strategies. ● Students may solve problems in different ways and have the flexibility to choose a mathematical strategy that allows them to make sense of and strategically solve problems using efficient methods that are most comfortable for and makes sense to them.	***Example*** ● Tom is baking a cake. He added $\frac{1}{2}$ teaspoon of vanilla extract to the cake mix. He tasted the batter and determined he needed more, so he added another $\frac{3}{4}$ teaspoon of vanilla extract. How much total vanilla extract did he add to the cake mix? ● *Possible student response*: A student may decompose one of the fractions to a make a benchmark number ($\frac{1}{2}$): $\frac{1}{2}+\frac{3}{4}$ $=\frac{1}{2}+(\frac{2}{4}+\frac{1}{4})$ $=(\frac{1}{2}+\frac{2}{4})+\frac{1}{4}$ $=1\frac{1}{4}$
5.NR.3.4	Model and solve problems involving multiplication of a fraction and a whole number.	***Strategies and Methods*** ● Students should be presented with a variety of practical, mathematical problems involving multiplication of a fraction and a whole number. ● Students should use their understanding of equivalency to flexibly reason with equivalent	***Age/Developmentally Appropriate*** ● Students should explain the meaning of a fraction $\frac{a}{b}$ as a multiple of $\frac{1}{b}$. ● Students should be exposed to fractions less than 1, equal to 1, and greater than 1.	***Examples*** ● Each cupcake takes $\frac{1}{4}$ cup of frosting. If Betty wants to make 20 cupcakes for a party, how much frosting will she need? ● Mr. Rogers need to make peanut butter and jelly sandwiches for 12 children. He wants to make $\frac{3}{4}$ of a sandwich for each child. How many sandwiches does he need to make?

		fractions based on the framework of the problem. Simplifying fractions is not an expectation of this grade level. ● Students may solve problems in different ways and have the flexibility to choose a mathematical strategy that allows them to make sense of and strategically solve problems using efficient methods that are most comfortable for and makes sense to them.		
5.NR.3.5	Explain why multiplying a whole number by a fraction greater than one results in a product greater than the whole number, and why multiplying a whole number by a fraction less than one results in a product less than the whole number and multiplying a whole number by a fraction equal to one results in a product equal to the whole number.	***Strategies and Methods*** ● Students should be presented with a variety of realistic, mathematical situations involving multiplication as scaling (resizing) that include fractions and whole numbers. ● Relevant problems can include word problems that are meaningful to a student's real environment. It is important for the problems presented to be relevant and interesting for the learners to pique their natural, intellectual curiosity.	***Example*** ● Mrs. Cole needs to make lunch for 12 children at a day care. Each child gets $\frac{1}{2}$ of a sandwich. How many whole sandwiches does Mrs. Cole need to make? *NOTE: The student should be able to recognize that the solution to 12 x $\frac{1}{2}$ will be less than 12 because each child only gets half of a sandwich.*	
5.NR.3.6	Model and solve problems involving division of a unit fraction by a whole number and a whole number by a unit fraction.	***Strategies and Methods*** ● Students should begin with modeling for deeper understanding. ● Students should be presented with a variety of authentic problems involving division of a whole number by a unit fraction and division of a unit fraction by a whole number. ● Relevant problems can include word problems that are meaningful to a student's real environment. It is important for the problems presented to be relevant and interesting for the learners to pique their natural, intellectual curiosity. ● Students may solve problems in different ways and have the flexibility to choose a mathematical strategy that allows them to make sense of and strategically solve problems using efficient methods that are most comfortable for and makes sense to them.	***Example*** ● Knowing the number of groups/shares and finding how many/much in each group/share Four students sitting at a table were given $\frac{1}{3}$ of a pan of brownies to share. How much of a pan will each student get if they share the pan of brownies equally? The diagram shows the $\frac{1}{3}$ pan divided into 4 equal shares with each share equaling $\frac{1}{12}$ of the pan.  	

5.NR.4: Read, write, and compare decimal numbers to the thousandths place, and round and perform operations with decimal numbers to the hundredths place to solve relevant, mathematical problems.

Expectations		Evidence of Student Learning (not all inclusive; see Grade Level Overview for more details)	
5.NR.4.1	Read and write decimal numbers to the thousandths place using base-ten numerals written in standard form and expanded form.	***Example*** ● $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (\frac{1}{10}) + 9 \times (\frac{1}{100}) + 2 \times (\frac{1}{1000})$	***Age/Developmentally Appropriate*** ● Base-ten numerals should range between millions and thousandths. ● Students are not expected to write decimal numbers in word form. ● Exponents and decimal numbers should not be included in expanded form notation. The decimal fractions used in Grade 5 should be limited to those for which the equivalent fraction can be written as a fraction where the denominator is a power of ten.
5.NR.4.2	Represent, compare, and order decimal numbers to the thousandths place based on the meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	***Strategies and Methods*** ● Students should be presented with decimal number comparisons from relevant, mathematical situations. ● Students should have opportunities to determine and explain comparisons using a variety of tools such as concrete materials, drawings, number lines, other visual representations, and strategies.	***Example*** ● Which is greater 0.13 or 0.031? Explain. Use a visual representation to illustrate your explanation. *I think 0.13 is greater because it fills up more of the whole square than 0.031 does.* 
5.NR.4.3	Use place value understanding to round decimal numbers to the hundredths place.	***Strategies and Methods*** ● Students should round decimal numbers to the hundredths place in practical, mathematical problems using visual aids, such as a number line.	
5.NR.4.4	Solve problems involving addition and subtraction of decimal numbers to the hundredths place using a variety of strategies.	***Strategies and Methods*** ● Students should be presented with a variety of practical situations involving addition and subtraction of decimal numbers to the hundredths place. ● Students should add and subtract decimal numbers to hundredths, using concrete models, drawings, strategies based on place value, properties of operations, and the relationship between addition and subtraction; relate the	***Age/Developmentally Appropriate*** ● Students should be given the choice of which strategy they can use. ● Students may solve problems in different ways and have the flexibility to choose a mathematical strategy that allows them to make sense of and strategically solve problems using efficient methods that are most comfortable for and makes sense to them.

		strategy to a written method and explain the reasoning used. ● Money may be used as a tool to aid in the student's understanding of adding and subtracting decimal numbers to the hundredths place.	

5.NR.5: Write, interpret, and evaluate numerical expressions within authentic problems.

Expectations		**Evidence of Student Learning** **(not all inclusive; see Grade Level Overview for more details)**		
5.NR.5.1	Write, interpret, and evaluate simple numerical expressions involving whole numbers with or without grouping symbols to represent actual situations.	***Age/Developmentally Appropriate*** ● Simple expressions should only include two operations. ● Grouping symbols used in expressions may include parentheses, brackets, or braces. ● Nested grouping symbols (more than one grouping symbol used within another grouping symbol in an expression) should not be used within expressions at this grade level. ● Appropriate numerical expressions should be no more complex than the expressions one finds in a simple application of the associative or distributive properties. Example: 15(2 + 10)	***Strategies and Methods*** ● Students should begin with concrete models. Concrete models may include color tiles or base ten blocks for constructing area models and rods for representing numerical values.	***Example*** ● Karl brought 3 ten-packs of juice boxes to the class party. Joshua brought 4 six-packs of soda to the party. How many drinks did they bring altogether? *Possible strategy:* $(3 \times 10) + (4 \times 6)$

<table>
<tr><td colspan="4">PATTERNING & ALGEBRAIC REASONING – generating patterns, plotting ordered pairs in the first quadrant</td></tr>
<tr><td colspan="4">5.PAR.6: Solve relevant problems by creating and analyzing numerical patterns using the given rule(s).</td></tr>
<tr><td colspan="2">Expectations</td><td colspan="2">Evidence of Student Learning
(not all inclusive; see Grade Level Overview for more details)</td></tr>
<tr><td>5.PAR.6.1</td><td>Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms by completing a table.</td><td>Fundamentals
This standard extends the work from fourth grade, where students generate numerical patterns when they are given one rule. In Fifth Grade, students are given two rules and generate two numerical patterns.</td><td>Age/Developmentally Appropriate
This learning objective is limited to patterns involving whole numbers.</td><td>Example
Sam and Terri live by a lake and enjoy going fishing together every day for five days. Sam catches 2 fish every day, and Terri catches 4 fish every day. Make a chart (table) to represent the number of fish that Sam and Terri catch.
<table><tr><th>Days</th><th>Sam's Total Number of Fish</th><th>Terri's Total Number of Fish</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>2</td><td>4</td></tr><tr><td>2</td><td>4</td><td>8</td></tr><tr><td>3</td><td>6</td><td>12</td></tr><tr><td>4</td><td>8</td><td>16</td></tr><tr><td>5</td><td>10</td><td>20</td></tr></table></td></tr>
<tr><td>5.PAR.6.2</td><td>Represent problems by plotting ordered pairs and explain coordinate values of points in the first quadrant of the coordinate plane.</td><td colspan="2">Age/Developmentally Appropriate
All four quadrants of the coordinate plane can be displayed, but students will only plot and label within the first quadrant.</td><td>Strategies and Methods
Students should be provided with a variety of authentic, mathematical problems involving graphing points in the first quadrant.
Relevant problems can include word problems that are meaningful to a student's real environment. It is important for the problems presented to be relevant and interesting for the learners to pique their natural, intellectual curiosity.
Students should interpret coordinate values of points based on the problem or situation presented.</td></tr>
</table>

MEASUREMENT & DATA REASONING *– measurements within the metric system, measurement conversions and time as a unit of measurement*			
5.MDR.7: Solve problems involving customary measurements, metric measurements, and time and analyze graphical displays of data to answer relevant questions.			
Expectations		**Evidence of Student Learning** **(not all inclusive; see Grade Level Overview for more details)**	
5.MDR.7.1	Explore realistic problems involving different units of measurement, including distance, mass, weight, volume, and time.	***Age/Developmentally Appropriate*** ● Fifth grade is the first time students are expected to convert between different units within the same measurement system. ● Students should be presented with realistic problems involving distance, mass, weight, volume, and time that are practical and relevant to their everyday lives. ● Students should have opportunities to solve problems involving customary and metric measurements. ● Relevant problems can include word problems that are meaningful to a student's real environment. It is important for the problems presented to be relevant and interesting for the learners to pique their natural, intellectual curiosity.	
5.MDR.7.2	Ask questions and answer them based on gathered information, observations, and appropriate graphical displays to solve problems relevant to everyday life.	***Fundamentals*** ● Relevant problems can include word problems that are meaningful to a student's real environment. It is important for the problems presented to be relevant and interesting for the learners to pique their natural, intellectual curiosity.	***Strategies and Methods*** ● Questions should be student generated.
5.MDR.7.3	Convert among units within the metric system and then apply these conversions to solve multi-step, practical problems.	***Age/Developmentally Appropriate*** ● Fifth grade is the first time students are expected to convert between different units within the same measurement system. ● Conversion chart should be provided. ● This objective is limited to the following unit conversions: ○ meters-kilo, centi, milli ○ liters-kilo, milli ○ grams - kilo, milli ● Conversions should be limited to 1000 times greater or $\frac{1}{1000}$ of the value of a given measure.	***Example*** ● Record measurement equivalents in a two-column table.
5.MDR.7.4	Convert among units within relative sizes of measurement units within the customary measurement system.	***Age/Developmentally Appropriate*** ● Fifth grade is the first time students are expected to convert between different units within the same measurement system. ● Conversion chart should be provided. ● This objective is limited to the following unit conversions: ○ fluid ounces, cups, pints, quarts, gallons ○ inches, feet, yards, miles ○ ounces, pounds, tons ● Conversions will be provided, such as 1 gallon = 4 quarts = 8 pints = 16 cups. ● Customary measurement units include weight (oz., lbs., tons) capacity (fl. oz, cups, pints, quarts, gallons), length (in., ft., yds., miles).	***Example*** ● Record measurement equivalents in a two-column table.

GEOMETRIC & SPATIAL REASONING *– Properties of polygons and rectangular prisms, classify polygons*					
5.GSR.8: Examine properties of polygons and rectangular prisms, classify polygons by their properties, and discover volume of right rectangular prisms.					
Expectations		**Evidence of Student Learning** **(not all inclusive; see Grade Level Overview for more details)**			
5.GSR.8.1	Classify, compare, and contrast polygons based on properties.	***Fundamentals*** ● Students should explore, compare, and contrast polygons based on properties.	***Strategies and Methods*** ● Polygons should include triangles, quadrilaterals including kites and trapezoids (rectangles, squares, rhombuses, and other parallelograms), pentagons, hexagons, and octagons. ● Properties may include angles, side lengths, symmetry, congruence, and the presence or absence of parallel or perpendicular lines. ● Students may use a variety of tools to measure angles and side lengths to make sense of the properties of polygons.	***Age/Developmentally Appropriate*** ● This objective does not require students to create a hierarchy. ● In Georgia resources and assessments, the inclusive definitions for the classification of shapes are used.	
5.GSR.8.2	Determine, through exploration and investigation, that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.	***Age/Developmentally Appropriate*** ● This objective does not require students to create a hierarchy. ● In Georgia resources and assessments, the inclusive definitions for the classification of shapes are used.	***Example*** ● All rectangles have four right angles and squares are rectangles, so all squares have four right angles. ● Students may use a variety of tools to measure angles and side lengths to make sense of the attributes of two-dimensional figures.		
5.GSR.8.3	Investigate volume of right rectangular prisms by packing them with unit cubes without gaps or overlaps. Then, determine the total volume to solve problems.	***Fundamentals*** ● Students should recognize volume as an attribute of solid figures.	***Terminology*** ● Total volume is defined as the total number of units that fill the space.	***Age/Developmentally Appropriate*** ● If students are provided with an image of a right rectangular prism, the unit cubes should be visible.	***Strategies and Methods*** ● Students should investigate authentic problems involving volume to make sense of this concept. ● Students should explore the volume of solid figures from realistic situations by packing them with unit cubes with no gaps or overlaps. ● Students should determine that a solid figure packed with *n* unit cubes is said to have a volume of *n* cubic units.
5.GSR.8.4	Discover and explain how the volume of a right rectangular prism can be found by multiplying the area of the base times the height to solve authentic, mathematical problems.	***Age/Developmentally Appropriate*** ● This objective does not require students to memorize a formula for the volume of a right rectangular prism. Rather, students are expected to use geometric and spatial reasoning to determine the volume, given the area of the base and the height.	***Fundamentals*** ● Students should explore the dimensions of all possible rectangular prisms given a total number of cubic units. ● The focus of this expectation is for students to understand the concept of volume rather than the formula.	***Terminology*** ● The dimensions of a rectangular prism can be referred to as length, width, and height. ● A cube with side length 1 unit, called “a unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume (e.g., cubic cm, cubic m, cubic in, cubic ft).	***Example*** ● We store our wooden unit cubes in a rectangular box that has a base with an area of 64 square units. The height of the box is 8 units. What is the volume of the box? Show your mathematical thinking.

ESSENTIAL INSTRUCTIONAL GUIDANCE

MATHEMATICAL PRACTICES

The Mathematical Practices describe the reasoning behaviors students should develop as they build an understanding of mathematics – the "habits of mind" that help students become mathematical thinkers. There are eight standards, which apply to all grade levels and conceptual categories.

These mathematical practices describe how students should engage with the mathematics content for their grade level. Developing these habits of mind builds students' capacity to become mathematical thinkers. These practices can be applied individually or together in mathematics lessons, and no particular order is required. In well-designed lessons, there are often two or more Mathematical Practices present.

MATHEMATICAL PRACTICES	
MP: Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	
Code	**Expectation**
MP.1	Make sense of problems and persevere in solving them.
MP.2	Reason abstractly and quantitatively.
MP.3	Construct viable arguments and critique the reasoning of others.
MP.4	Model with mathematics.
MP.5	Use appropriate tools strategically.
MP.6	Attend to precision.
MP.7	Look for and make use of structure.
MP.8	Look for and express regularity in repeated reasoning.

MATHEMATICAL MODELING

Teaching students to model with mathematics is engaging, builds confidence and competence, and gives students the opportunity to collaborate and make sense of the world around them, the main reason for doing mathematics. For these reasons, mathematical modeling should be incorporated at every level of a student's education. This is important not only to develop a deep understanding of mathematics itself, but more importantly to give students the tools they need to make sense of the world around them. Students who engage in mathematical modeling will not only be prepared for their chosen career but will also learn to make informed daily life decisions based on data and the models they create.

The diagram below is a mathematical modeling framework depicting a cycle of how students can engage in mathematical modeling when solving a realistic problem or task.

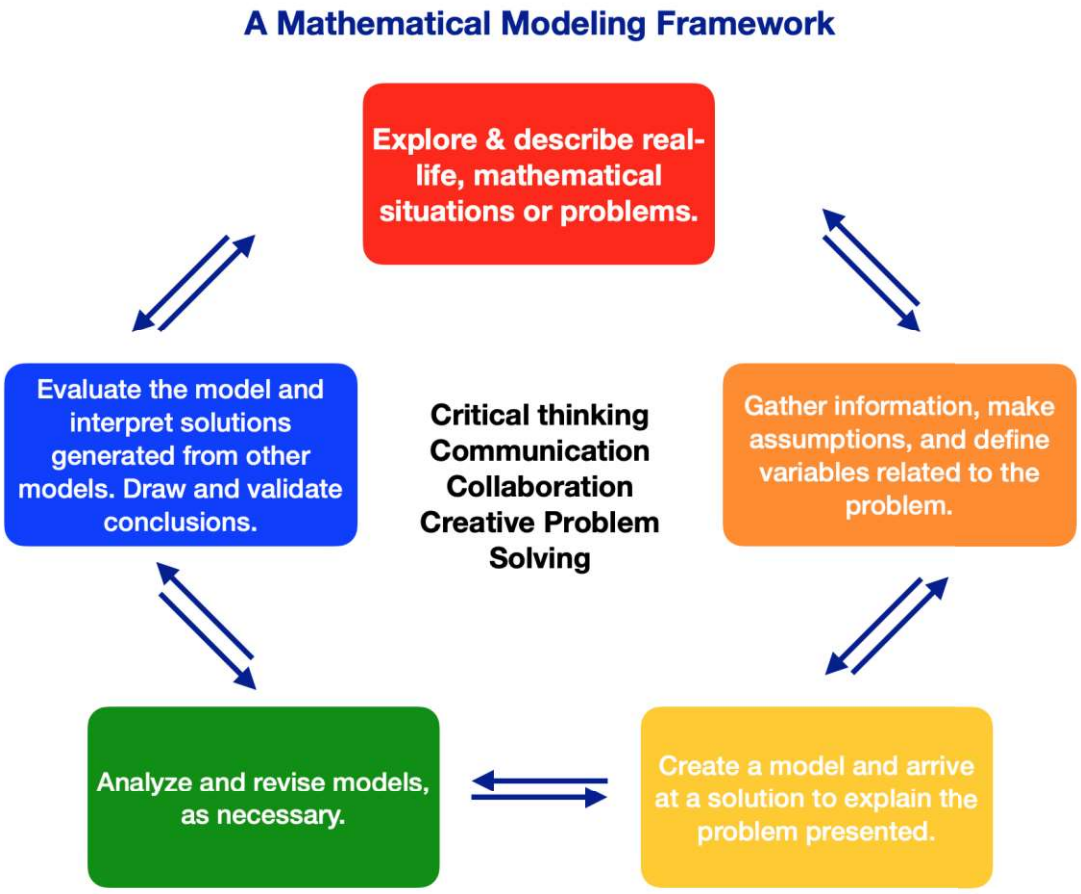


Image adapted from: Suh, Matson, Seshaiyer, 2017

FRAMEWORK FOR STATISTICAL REASONING

Statistical reasoning is important for learners to engage as citizens and professionals in a world that continues to change and evolve. Humans are naturally curious beings and statistics is a language that can be used to better answer questions about personal choices and/or make sense of naturally occurring phenomena. Statistics is a way to ask questions, explore, and make sense of the world around us.

The Framework for Statistical Reasoning should be used in all grade levels and courses to guide learners through the sense-making process, ultimately leading to the goal of statistical literacy in all grade levels and courses. Reasoning with statistics provides a context that necessitates the learning and application of a variety of mathematical concepts.

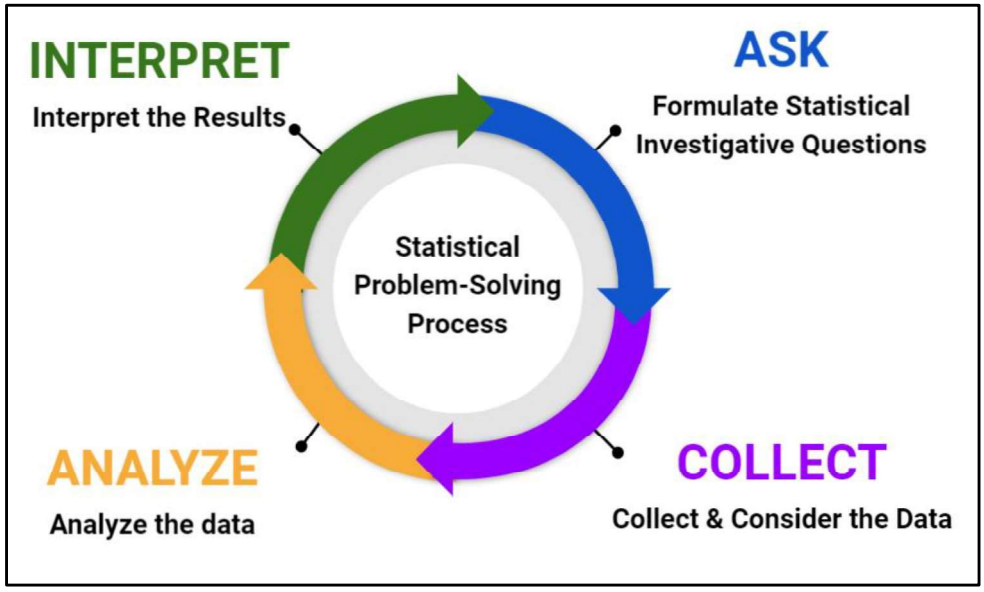


FIGURE 1: GEORGIA FRAMEWORK FOR STATISTICAL REASONING

The following four-step statistical problem-solving process can be used throughout each grade level and course to help learners develop a solid foundation in statistical reasoning and literacy:

I. Formulate Statistical Investigative Questions
Ask questions that anticipate variability.

II. Collect & Consider the Data
Ensure that data collection designs acknowledge variability.

III. Analyze the Data
Make sense of data and communicate what the data mean using pictures (graphs) and words. Give an accounting of variability, as appropriate.

IV. Interpret the Results
Answer statistical investigative questions based on the collected data.

4th Grade: Create statistical investigative questions that can be answered using data. Collect, analyze, and interpret data from real situations to answer questions using **dot plots** displaying **numerical data to the nearest 1/8 of a unit.**

Ask	Collect	Analyze	Interpret
Create a statistical investigative question that can be answered using data from real situations.	**Determine strategies for gathering data. Collect numerical (quantitative) data by measuring repeatedly to the nearest $\frac{1}{8}$ of a unit.**	**Determine the appropriate representation of the data based on the nature of the data (bar graphs, pictographs, and dot plots).** **Determine the difference between categorical and numerical data.**	**Create dot plots to display a distribution of numerical (quantitative) measurement data.** **Interpret numerical data to answer the statistical investigative question created.**

Instructional Supports

- Expectations in this grade level should be taught throughout the year and applied contextually to the current expectation and actual events.
- Students should be given opportunities to generate a statistical investigative question based on things they notice and wonder about an everyday situation.
- Based on the statistical investigative question, they should create a plan that determines the appropriate population to survey and how to collect that data.
- Students should have opportunities to determine the difference between representations for categorical data and numerical data presented. Representations for data should include bar graphs, pictographs, and dot plots (line plots).
- Students should be able to measure objects found in everyday life to collect data and use rulers to measure to the nearest 1/8.
- Students should record observations they notice about the shape of the distribution using informal language such as spread out and/or grouped.
- *Numerical data:* A data type expressed in numbers rather than natural language descriptions. This is sometimes called quantitative data.

5th Grade: Create statistical investigative questions that can be answered by using **quantitative (numerical)** and **categorical data**. Determine strategies for gathering data to answer questions. Collect, analyze, and interpret data presented on **dot plots** and **bar graphs** from real situations to answer questions about the **data distribution, spread,** and **center.**

Ask	Collect	Analyze	Interpret
Create a statistical investigative question that can be answered by gathering data from real situations.	**Develop up to five survey questions that would yield the data needed to answer the statistical investigative question.**	**Graphically represent and describe the distribution of the numerical data through dot plots and line plots or categorical data through bar graphs.**	**Describe and interpret the center of the distribution by the equal share value (mean).**

Instructional Supports

- Expectations in this grade level should be taught throughout the year and applied contextually to the current expectation and actual events.
- Students can generate questions about things they notice and wonder from an authentic situation. Based on the posed question, create a plan that determines the appropriate population to survey and how to collect that data. Students should be provided with learning experiences to collect and analyze both numerical data and categorical data from a variety of sources.
- Students should be given ample experience with organizing, representing, and analyzing data from everyday contexts. Data should not be limited to numerical data collected from linear measurements. Students should be given the opportunity to use manipulatives such as: snap cubes, tiles, etc...to model equal share value.
- Students should continue to create dot plots (line plots) with measurements in fractions of a unit (1/2, 1/4, 1/8).
- This is the beginning of the progression of the concept of measures of center and will continue to be developed in 6th grade. The mean formula is not an expectation in 5th grade. This concept should be explored visually and conceptually.
- Distribution refers to how the data is spread across the graph.
- Dot plots and line plots can be used interchangeably. Dot plots should be used for numerical data representation on a number line.
- *Numerical data* is data that expressed in numbers rather than natural language. An example of numerical data that could be collected is the number of people who attended the movie theater over the course of a month. *Categorical data* is a type of data that is used to group information with similar characteristics. Examples of categorical data that could be collected might be marital status, favorite sport, or favorite type of movie.

COMPUTATIONAL STRATEGIES FOR WHOLE NUMBERS

Mathematics Place-Value Strategies and US Traditional Algorithms

Specific mathematics strategies for teaching and learning are not mandated by the Georgia Department of Education or assessed on state or federally mandated tests. Students may solve problems in different ways and have the flexibility to choose a mathematical strategy that allows them to make sense of and strategically solve problems using efficient methods that are most comfortable for and makes sense to them. It is critical that teachers and parents remain partners to help each child grow to become a mathematically literate citizen. These standards preserve and affirm local control and flexibility.

In mathematics, the emphasis is on the reasoning and thinking about the quantities within mathematical contexts. Algorithms, tape diagrams (bar models), and number line representations are a few examples of ways that students communicate their strategic thinking in a written form.

Addition Example: 1573 + 796

US Traditional Algorithm:

$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ \ \ } \\ 1\ 5\ 7\ 3 \\ +\ \ 7\ 9\ 6 \\ \hline 2\ 3\ 6\ 9 \end{array}$$

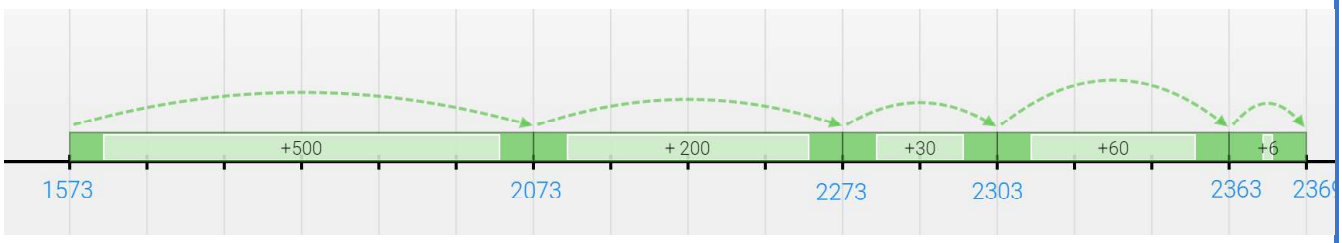
Description:

As students make sense of and use addition strategies and algorithms, it is important for them to be given the flexibility to use a part-whole strategy such as place value partitioning, adding on in parts, estimation and compensation, and friendly numbers to communicate their thinking using a written recording of that strategy that is most comfortable for and makes sense to them. Students should be able to demonstrate a deep understanding of the relationship between the quantities presented in the mathematics number sentence and to attend to precision in their explanations. Flexibility in thinking is key!

Place Value Algorithm:

$$\begin{array}{rrrr} 1 & 5 & 7 & 3 \\ + & 7 & 9 & 6 \\ \hline & & & 9 \\ + & 1 & 6 & 0 \\ + & 1 & 2 & 0 & 0 \\ + & 1 & 0 & 0 & 0 \\ \hline 2 & 3 & 6 & 9 \end{array}$$

Number Line Representation:



It is important to note that the examples of strategies provided in the tables are not all inclusive. Students may solve problems in different ways and have the flexibility to choose a mathematical strategy that allows them to make sense of and strategically solve problems using efficient methods that are most comfortable for and makes sense to them.

Subtraction Example: 2145 - 178

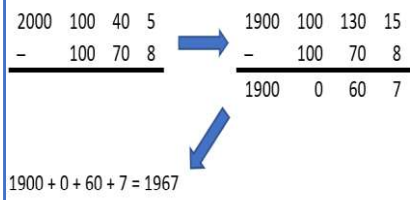
US Traditional Algorithm:

$$\begin{array}{r} {\scriptstyle 0\ \ 13\ \ 15} \\ 2\ \ \not{1}\ \ \not{4}\ \ \not{5} \\ -\quad 1\ \ 7\ \ 8 \\ \hline 1\ \ 9\ \ 6\ \ 7 \end{array}$$

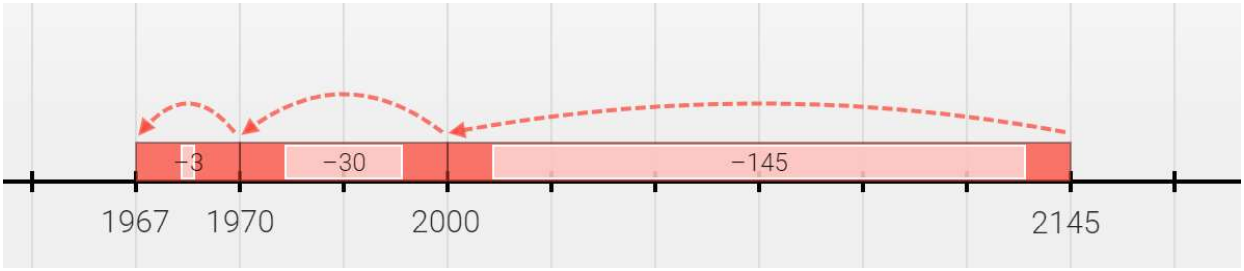
Description:

As students make sense of and use subtraction strategies and algorithms, it is important for them to be given the flexibility to use a part-whole strategy such as place value partitioning, adding up, counting back in chunks, and same difference and communicate their thinking using a written recording of that strategy that is most comfortable for and makes sense to them. Students should be able to demonstrate a deep understanding of the relationship between the quantities presented in the mathematics number sentence and to attend to precision in their explanations. Flexibility in thinking is key!

Place Value Algorithm:



Number Line Representation:



It is important to note that the examples of strategies provided in the tables are not all inclusive. Students may solve problems in different ways and have the flexibility to choose a mathematical strategy that allows them to make sense of and strategically solve problems using efficient methods that are most comfortable for and makes sense to them.

Multiplication Example: 25 x 24

US Traditional Algorithm:

$$\begin{array}{r} {\scriptstyle 1\ \ 2}\ 25 \\ \times\ 24 \\ \hline 100 \\ +\ 500 \\ \hline 600 \end{array}$$

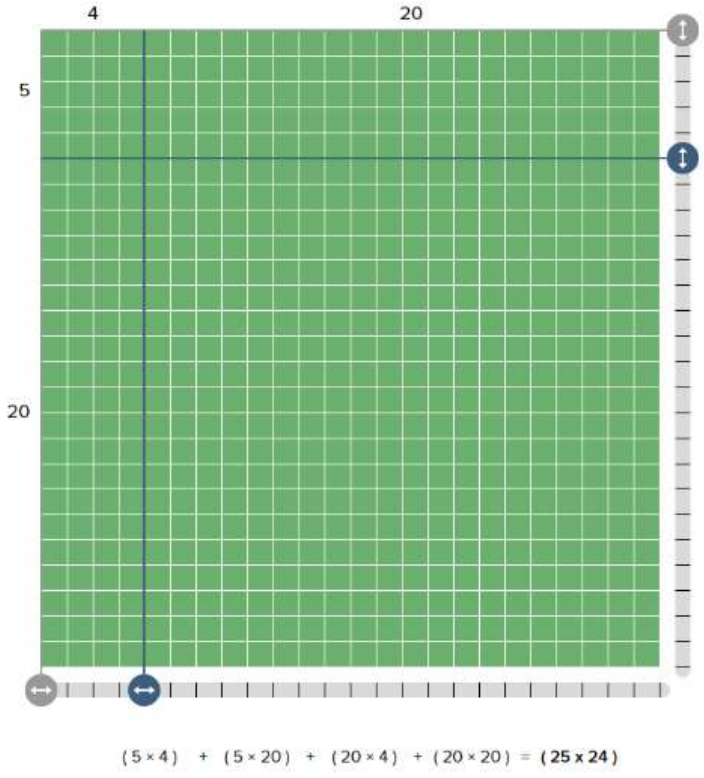
Description:

As students make sense of and use multiplication strategies and algorithms, it is important for them to demonstrate a deep understanding of the relationship between the quantities presented in the mathematics number sentence and to attend to precision in their explanations. Students are encouraged to use strategies such as partial products, friendly numbers, and a combination of known facts to determine solutions to new problems. It is also important for students to maintain the ability to choose which part-whole strategy is best to communicate their mathematical thinking. Flexibility in thinking is key!

Place Value Algorithm:

$$\begin{array}{rrl} & 25 & \\ \times & 24 & \\ \hline & 400 & (20 \times 20) \\ + & 100 & (20 \times 5) \\ + & 80 & (4 \times 20) \\ + & 20 & (4 \times 5) \\ \hline & 600 & \end{array}$$

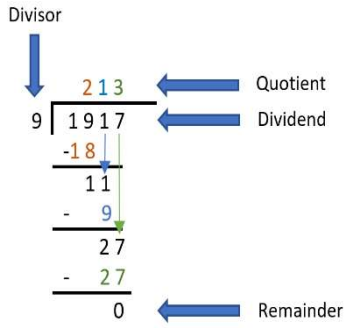
Area Representation (Partial Products):



It is important to note that the examples of strategies provided in the tables are not all inclusive. Students may solve problems in different ways and have the flexibility to choose a mathematical strategy that allows them to make sense of and strategically solve problems using efficient methods that are most comfortable for and makes sense to them.

Division Example: 1917 ÷ 9

US Traditional Algorithm:



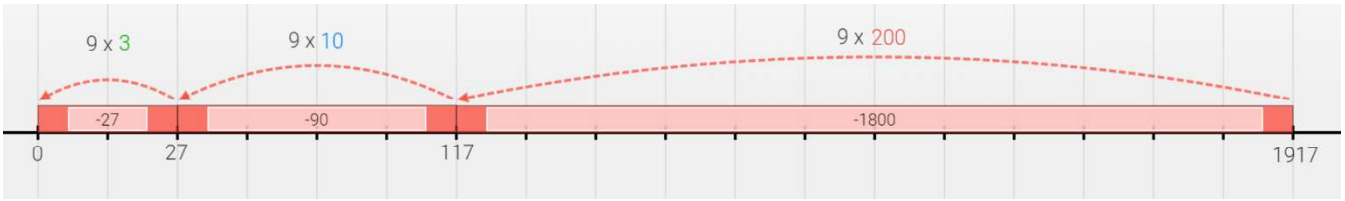
Description:

As students make sense of and use division strategies and algorithms, it is important for them to demonstrate a deep understanding of the relationship between the quantities. Students are encouraged to use strategies such as partial quotients, friendly numbers, and repeated subtraction to determine solutions to new problems. It is also important for students to maintain the ability to choose which strategy is best to communicate their mathematical thinking. Flexibility in thinking is key!

Place Value Algorithm:

9 | 1917	
-1800	200
117	
-90	+ 10
27	
-27	+ 3
0	213

Number Line Representation:



200 + 10 + 3 = 213

It is important to note that the examples of strategies provided in the tables are not all inclusive. Students may solve problems in different ways and have the flexibility to choose a mathematical strategy that allows them to make sense of and strategically solve problems using efficient methods that are most comfortable for and makes sense to them.