Intervention Content Focus (K-8)

Within all grades and courses, there are mathematics standards that have been identified as foundational standards whose understanding is paramount for students in order for them to have the deep conceptual understanding of mathematics necessary to prepare them for post-secondary readiness. Mastering these major work of the grade standards is key for student success at subsequent grade levels. The K-8 major work of the grade standards provide a progression of learning to prepare students for success in algebra which is often viewed as the gatekeeper for post-secondary success.

These algebraic progressions within the K-8 major work of the grade standards can help identify the content where intervention should focus when it is determined that a student needs instructional support. It is the recommendation that these standards are prevalent forces during intervention times along with a **constant emphasis on whole and rational number operations and fluency**.

The following document has been adapted from its original design by *achievethecore.org*. The chart focuses on algebraic progressions and can be used to help determine the content focus of intervention based on the instructional level of the student. While the chart is outlined by cluster, clicking on any particular cluster will take you to full standard included following the chart. Ultimately, students who have strong command of these standards are well equipped to be successful in algebraic endeavors. Further, prioritizing the content found in these standards for students who are behind will help them have an access point to grade-level standards.

Once the content of intervention has been identified, the instructional focus documents created by the Tennessee Department of Education can provide guidance on strong mathematics instruction by standard. Both the full document containing all Tennessee Mathematics Standards and the Instructional Focus Documents can be found here.

Tennessee Mathematics Standards and the Instructional Focus Documents can be found here.

TN Department of Education

K - 8 Content Focus

Progression to Algebra Standards

K	1	2	3	4	5	6	7	8
K.CC.A - Know number names and the counting sequence. K.CC.B - Count to tell the number of objects. K.CC.C - Compare numbers. K.OA.A - Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from. K.NBT.A - Work with numbers 11–19 to gain foundations for place value. **Fluency:** K.OA.A.5 - Fluently add and subtract within 10 using mental strategies.	1.OA.A - Represent and solve problems involving addition and subtraction. 1.OA.B - Understand and apply properties of operations and the relationship between addition and subtraction. 1.OA.C - Add and subtract within 20. 1.OA.D - Work with addition and subtraction equations. 1.NBT.A - Extend the counting sequence. 1.NBT.B - Understand place value. 1.NBT.C - Use place value understanding and the properties of operations to add and subtract. 1.MD.A - Measure lengths indirectly and by iterating length units. **Fluency:** 1.OA.C.6 - Fluently add and subtract within 20 using mental strategies. By the end of 1st grade, know from memory all sums up to 10.	2.OA.A - Represent and solve problems involving addition and subtraction. 2.OA.B - Add and subtract within 30. 2.NBT.A - Understand place value. 2.NBT.B - Use place value understanding and properties of operations to add and subtract. 2.MD.A - Measure and estimate lengths in standard units. 2.MD.B - Relate addition and subtraction to length. **Fluency:** 2.OA.B.2 – Fluently add and subtract within 30 using mental strategies. By the end of 2nd grade, know from memory all sums of two one-digit numbers and related subtraction facts. 2.NBT.B.5 – Fluently add and subtract within 100 using properties of operations, strategies based on place value, and/or the relationship between addition and subtraction.	3.OA.A - Represent and solve problems involving multiplication and division. 3.OA.B - Understand properties of multiplication and the relationship between multiplication and division. 3.OA.C - Multiply and divide within 100. 3.OA.D - Solve problems involving the four operations, and identify and explain patterns in arithmetic. 3.NF.A - Develop understanding of fractions as numbers. 3.MD.A - Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. 3.MD.C - Geometric measurement: understand concepts of area and relate area to multiplication and to addition. **Fluency:** 3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of 3rd grade, know from memory all products of two one-digit numbers and related division facts. 3.NBT.A.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. (Supporting Cluster)	4.OA.A - Use the four operations with whole numbers to solve problems. 4.NBT.A Generalize place value understanding for multi-digit whole numbers. 4.NBT.B - Use place value understanding and properties of operations to perform multi-digit arithmetic. 4.NF.A - Extend understanding of fraction equivalence and comparison. 4.NF.B - Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. 4.NF.C - Understand decimal notation for fractions, and compare decimal fractions. **Fluency:** 4.NBT.B.4 – Fluently add and subtract within 1,000,000 using appropriate strategies and algorithms.	5.NBT.A - Understand the place value system. 5.NBT.B - Perform operations with multi-digit whole numbers and with decimals to hundredths. 5.NF.A - Use equivalent fractions as a strategy to add and subtract fractions. 5.NF.B - Apply and extend previous understandings of multiplication and division to multiply and divide fractions. 5.MD.C - Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. **Fluency:** 5.NBT.B.5 Fluently multiply multi-digit whole numbers (up to three-digit by four-digit factors) using appropriate strategies and algorithms.	6.RP.A - Understand ratio concepts and use ratio reasoning to solve problems. 6.NS.A - Apply and extend previous understandings of multiplication and division to divide fractions by fractions. 6.NS.C - Apply and extend previous understandings of numbers to the system of rational numbers. 6.EE.A - Apply and extend previous understandings of arithmetic to algebraic expressions. 6.EE.B - Reason about and solve one-variable equations and inequalities. 6.EE.C - Represent and analyze quantitative relationships between dependent and independent variables. **Fluency:** 6.NS.B.2 – Fluently divide multi-digit numbers using a standard algorithm. 6.NS.B.3 – Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each question. (Supporting Cluster)	7.RP.A - Analyze proportional relationships and use them to solve real-world and mathematical problems. 7.NS.A - Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers. 7.EE.A - Use properties of operations to generate equivalent expressions. 7.EE.B - Solve real-life and mathematical problems using numerical and algebraic expressions and equations and inequalities.	8.EE.A - Work with radicals and integer exponents. 8.EE.B - Understand the connections between proportional relationships, lines, and linear equations. 8.EE.C - Analyze and solve linear equations and systems of two linear equations. 8.F.A - Define, evaluate, and compare functions. 8.F.B - Use functions to model relationships between quantities. 8.G.B – Understand and apply the Pythagorean Theorem.

Tennessee Mathematics Standards and the Instructional Focus Documents can be found here.

TN Department of Education

Kindergarten

Counting and Cardinality (CC)

K.CC.A – Know number names and the counting sequence.

K.CC.A.1 - Count to 100 by ones, fives, and tens. Count backward from 10.

K.CC.A.2 - Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

K.CC.A.3 - Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20.

K.CC.B – Count to tell the number of objects.

K.CC.B.4 - Understand the relationship between numbers and quantities; connect counting to cardinality.

K.CC.B.4a - When counting objects, say each number names in the standard order, using one-to-one correspondence

K.CC.B.4b - Recognize that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.

K.CC.B.4c - Recognize that each successive number name refers to a quantity that is one greater.

K.CC.B.5 - Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration. Given a number from 1 to 20, count out that many objects.

K.CC.C – Compare numbers.

K.CC.6 - Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group.

K.CC.7 - Compare two given numbers up to 10, when written as numerals, using the terms *greater than, less than, or equal to*.

Operations and Algebraic Thinking (OA)

K.OA.A – Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

K.OA.A.1 - Represent addition and subtraction with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions, or equations.

K.OA.A.2 - Add and subtract within 10 to solve contextual problems using objects or drawings to represent the problem.

K.OA.A.3 - Decompose numbers less than or equal to 10 into addend pairs in more than one way (e.g. 5 = 2 + 3 and 5 = 4 + 1) by using objects or drawings. Record each decomposition using a drawing or writing an equation.

K.OA.A.4 - Find the number that makes 10, when added to the given number, when added to any given number, from 1 to 9 using objects or drawings. Record the answer using a drawing or writing an equation.

K.OA.A.5 - Fluently add and subtract within 10 using mental strategies.

Number and Operations in Base Ten (NBT)

K.NBT.A – Work with numbers 11–19 to gain foundations for place value.

K.NBT.A.1 - Compose and decompose numbers from 11 to 19 into ten ones and some more ones by using objects or drawings. Record the composition or decomposition using a drawing or by writing an equation.

TN Department of Education

1st Grade

Operations and Algebraic Thinking (OA)

1.OA.A – Represent and solve problems involving addition and subtraction.

1.OA.A.1 - Add and subtract within 20 to solve contextual problems, with unknowns, in all positions, involving situations of *add to, take from, put together/take apart*, and *compare*. Use objects, drawings, and equations with a symbol for the unknown number to represent the problem.

1.OA.A.2 - Add three whole numbers whose sum is within 20 to solve contextual problems using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

1.OA.B – Understand and apply properties of operations and the relationship between addition and subtraction.

1.OA.B.3 - Apply properties of operations (additive identity, commutative, and associative) as strategies to add and subtract. (Students need not use formal terms for these properties.)

1.OA.B.4 - Understand subtraction as an unknown-addend problem. *For example, to solve 10 – 8 = ___, a student can use 8 + ___ = 10.*

1.OA.C – Add and subtract within 20.

1.OA.C.5 - Add and subtract within 20 using strategies such as counting on, counting back, making 10, using fact families and related known facts, and composing/decomposing numbers with an emphasis on making ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9 or adding 6 + 7 by creating the known equivalent 6 + 4 + 3 = 10 + 3 = 13).

1.OA.C.6 - Fluently add and subtract within 20 using mental strategies. By the end of 1st grade, know from memory all sums up to 10.

1.OA.D – Work with addition and subtraction equations.

1.OA.D.7 - Understand the meaning of the equal sign (6 = 6; 5 + 2 = 4 + 3; 7 = 8 – 1). Determine if equations involving addition and subtraction are true or false.

1.OA.D.8 - Determine the unknown whole number in an addition or subtraction equation, with the unknown in any position (e.g., 8 + ? = 11, 5 = ? – 3, 6 + 6 = ?).

Number and Operations in Base Ten (NBT)

1.NBT.A – Extend the counting sequence.

1.NBT.A.1 - Count to 120 starting at any number. Read and write numerals to 120 and represent a number of objects with a written numeral. Count backward from 20.

1.NBT.B – Understand place value.

1.NBT.B.2 - Know that the two digits of a two-digit number represent groups of tens and ones (e.g., 39 can be represented as 39 ones, 2 tens and 19 ones, or 3 tens and 9 ones).

1.NBT.B.3 - Compare two two-digit numbers based on meanings of the digits in each place and use the symbols >, =, and < to show the relationship.

1.NBT.C – Use place value understanding and properties of operations to add and subtract.

1.NBT.C.4 - Add a two-digit number to a one-digit number and a two-digit number to a multiple of ten (within 100). Use concrete models, drawings, strategies based on place value, properties of operations, and/or the relationship between addition and subtraction to explain the reasoning used.

1.NBT.C.5 - Mentally find 10 more or 10 less than a given number without having to count by ones and explain the reasoning used.

1.NBT.C.6 - Subtract multiples of 10 from multiples of 10 in the range 10-90 using concrete models, drawings, strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

Measurement and Data (MD)

1.MD.A – Measure lengths indirectly and by iterating length units.

1.MD.A.1 - Order three objects by length. Compare the lengths of two objects indirectly by using a third object. *For example, to compare indirectly the heights of Bill and Susan: if Bill is taller than mother and mother is taller than Susan, then Bill is taller than Susan.*

1.MD.A.2 - Measure the length of an object using non-standard units.

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2nd Grade

Operations and Algebraic Thinking (OA)

2.OA.A – Represent and solve problems involving addition and subtraction.

2.OA.A.1 - Use addition and subtraction within 100 to solve one- and two-step contextual problems, with unknowns in all positions, involving situations of *add to, take from, put together/take apart*, and *compare*. Use objects, drawings, and equations with a symbol for the unknown number to represent the problem.

2.OA.B – Add and subtract within 30.

2.OA.B.2 - Fluently add and subtract within 30 using mental strategies. By the end of 2nd grade, know from memory all sums of two one-digit numbers and related subtraction facts.

Number and Operations in Base Ten (NBT)

2.NBT.A – Understand place value.

2.NBT.A.1 - Know that the three digits of a three-digit number represent amounts of hundreds, tens, and ones (e.g. 706 can be represented in multiple ways as 7 hundreds, 0 tens, and 6 ones; 706 ones; or 70 tens and 6 ones).

2.NBT.A.2 - Count within 1000. Skip-count within 1000 by 5s, 10s, and 100s starting from any number in its skip counting sequence.

2.NBT.A.3 - Read and write numbers to 1000 using standard form, word form, and expanded form.

2.NBT.A.4 - Compare two three-digit numbers based on meanings of the digits in each place and use the symbols >, =, and < to show the relationship.

2.NBT.B – Use place value understanding and properties of operations to add and subtract.

2.NBT.B.5 - Fluently add and subtract within 100 using properties of operations, strategies based on place value, and/or the relationship between addition and subtraction.

2.NBT.B.6 - Add up to four two-digit numbers using properties of operations and strategies based on place value.

2.NBT.B.7 - Add and subtract within 1000 using concrete models, drawings, and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

2.NBT.B.8 - Mentally add 10 or 100 to a given number 100 – 900, and mentally subtract 10 or 100 from a given number 100 – 900.

2.NBT.B.9 - Explain why addition and subtraction strategies work using properties of operations and place value. (Explanations may include words, drawings, or objects.)

Measurement and Data (MD)

2.MD.A – Measure and estimate lengths in standard units.

2.MD.A.1 - Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

2.MD.A.2 - Measure the length of an object using different units of measure and describe how the two measurements relate to the size of the unit chosen.

2.MD.A.3 - Estimate lengths using units of inches, feet, yards, centimeters, and meters.

2.MD.A.4 - Measure to determine how much longer one object is than another and express the difference in terms of a standard unit of length.

2.MD.B – Relate addition and subtraction to length.

2.MD.B.5 - Add and subtract within 100 to solve contextual problems involving lengths that are given in the same units by using drawings and equations with a symbol for the unknown to represent the problem.

2.MD.B.6 - Represent whole numbers as lengths from 0 on a number line and know that the points corresponding to the numbers on the number line are equally spaced. Use a number line to represent whole number sums and differences of lengths within 100.

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3rd Grade

Operations and Algebraic Thinking (OA)

3.OA.A – Represent and solve problems involving multiplication and division.

3.OA.A.1 - Interpret the factors and products in whole number multiplication equations (e.g., 4 x 7 is 4 groups of 7 objects with a total of 28 objects or 4 strings measuring 7 inches each with a total of 28 inches.)

3.OA.A.2 - Interpret the dividend, divisor, and quotient in whole number division equations (e.g., 28 ÷ 7 can be interpreted as 28 objects divided into 7 equal groups with 4 objects in each group or 28 objects divided so there are 7 objects in each of the 4 equal groups).

3.OA.A.3 - Multiply and divide within 100 to solve contextual problems, with unknowns in all positions, in situations involving equal groups, arrays, and measurement quantities using strategies based on place value, the properties of operations, and the relationship between multiplication and division (e.g., contexts including computations such as 3 x ? = 24, 6 x 6 = ?, ? ÷ 8 = 3, or 96 ÷ 6 = ?)

3.OA.A.4 - Determine the unknown whole number in a multiplication or division equation relating three whole numbers within 100. *For example, determine the unknown number that makes the equation true in each of the equations: 8 x ? = 48, 5 = ? ÷ 3, 6 x 6 = ?*

3.OA.B – Understand properties of multiplication and the relationship between multiplication and division.

3.OA.B.5 - Apply properties of operations as strategies to multiply and divide. (Students need not use formal terms for these properties.) *Examples: If 6 x 4 = 24 is known, then 4 x 6 = 24 is also known (Commutative property of multiplication). 3 x 5 x 2 can be solved by (3 x 5) x 2 or 3 x (5 x 2) (Associative property of multiplication.) One way to find 8 x 7 is by using 8 x (5 + 2) = (8 x 5) + (8 x 2). By knowing that 8 x 5 = 40 and 8 x 2 = 16, then 8 x 7 = 40 + 16 = 56 (Distributive property of multiplication over addition).*

3.OA.B.6 - Understand division as an unknown-factor problem. *For example, find* $32 \div 8$ *by finding the number that makes 32 when multiplied by 8.*

3.OA.C – Multiply and divide within 100.

3.OA.C.7 - Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of 3rd grade, know from memory all products of two one-digit numbers and related division facts.

3.OA.D – Solve problems involving the four operations and identify and explain patterns in arithmetic.

3.OA.D.8 - Solve two-step contextual problems using any of the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

3.OA.D.9 - Identify arithmetic patterns (including patterns in the addition or multiplication tables) and explain them using properties of operations. *For example, observe that 4 times a number is always even (because 4 x 6 = (2 x 2) x 6 = 2 x (2 x 6), which uses the associative property of multiplication.*

Number and Operations - Fractions (NF)

Limit denominators of fractions to 2, 3, 4, 6, and 8.

3.NF.A – Develop understanding of fractions as numbers.

3.NF.A.1 - Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into *b* equal parts (unit fraction); understand a fraction $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$. *For example,* $\frac{3}{4}$ *represents a quantity formed by 3 parts of size* $\frac{1}{4}$.

3.NF.A.2 - Understand a fraction as a number on the number line. Represent fractions on a number line.

3.NF.A.2a - Represent a fraction $\frac{1}{b}$ on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size $\frac{1}{b}$ and that the endpoint locates the number $\frac{1}{b}$ on the number line. *For example, on a number line from 0 to 1, students can partition it into 4 equal parts and recognize that each part represents a length of* $\frac{1}{4}$ *and the first part has an endpoint at* $\frac{1}{4}$ *on the number line.*

3.NF.A.2b - Represent a fraction $\frac{a}{b}$ on a number line diagram by marking off *a* lengths $\frac{1}{b}$ from 0. Recognize that the resulting interval has size $\frac{a}{b}$ and that its endpoint locates the number $\frac{a}{b}$ on the number line. *For example,* $\frac{5}{3}$ *is the distance from 0 when there are 5 iterations of* $\frac{1}{3}$

3.NF.A.3 - Explain equivalence of fractions and compare fractions by reasoning about their size.

3.NF.A.3a - Understand two fractions as equivalent (equal) if they are the same size or the same point on a number line.

3.NF.A.3b - Recognize and generate simple equivalent fractions (e.g. $\frac{1}{2} = \frac{2}{4}, \frac{4}{6} = \frac{2}{3}$). Explain why the fractions are equivalent using a visual fraction model.

3.NF.A.3c - Express whole numbers as fractions and recognize fractions that are equivalent to whole numbers. *For example: express 3 in the form* $3 = \frac{3}{1}$*; recognize that* $\frac{6}{1} = 6$*; locate* $\frac{4}{4}$ *and 1 at the same point of a number line diagram.*

3.NF.A.3d - 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. Use the symbols >, =, or <, to show relationship and justify the conclusions.

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Measurement and Data (MD)

3.MD.A – Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

3.MD.A.1 - Tell and write time to the nearest minute and measure time intervals in minutes. Solve contextual problems involving addition and subtraction of time intervals in minutes. *For example, students may use a number line to determine the difference between the start time and the end time of lunch.*

3.MD.A.2 - Measure the mass of objects using standard units of grams (g), kilograms (kg), milliliters (ml), and liters (l). Estimate the mass of objects and liquid volume using benchmarks. *For example, a large paper clip is about on gram, so a box of about 100 large clips is about 100 grams.*

3.MD.C – Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

3.MD.C.5 - Recognize that plane figures have an area and understand concepts of area measurement.

3.MD.C.5a - Understand that a square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area and can be used to measure area.

3.MD.C.5b - Understand that a plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.

3.MD.C.6 - Measure areas by counting unit squares (square centimeters, square meters, square inches, square feet, and improvised units).

3.MD.C.7 - Relate area to the operations of multiplication and addition.

3.MD.C.7a - Find the area of a rectangle with whole-number side lengths by tiling it and show that the area is the same as would be found by multiplying the side lengths.

3.MD.C.7b - Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real-world and mathematical problems and represent whole-number products as rectangular areas in mathematical reasoning.

3.MD.C.7c - Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths *a* and *b + c* is the sum of *a x b*and *a x c*. Use area models to represent the distributive property in mathematical reasoning. *For example, in a rectangle with dimensions 4 by 6, students can decompose the rectangle into 4 x 3 and 4 x 3 to find the total area of 4 x 6.*

3.MD.C.7d - Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real-world problems.

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4th Grade

Operations and Algebraic Thinking (OA)

4.OA.A – Use the four operations with whole numbers to solve problems.

4.OA.A.1 - Interpret a multiplication equation as a comparison (e.g. interpret 35 = 5 x 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5.) Represent verbal statements of multiplicative comparisons as multiplication equations.

4.OA.A.2 - Multiply or divide to solve contextual problems involving multiplicative comparison, and distinguish multiplicative comparison from additive comparison. *For example, school A has 300 students and school B has 600 students: to say that school B has two times as many students is an example of multiplicative comparison; to say that school B has 300 more students is an example of additive comparison.*

4.OA.A.3 - Solve multi-step contextual problems posed with whole numbers and having whole number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Number and Operations in Base Ten (NBT)

4.NBT.A – Generalize place value understanding for multi-digit whole numbers.

4.NBT.A.1 - Recognize that in a multi-digit whole number (less than or equal to 1,000,000), a digit in one place represents ten times as much as it represents in the place to its right*. For example, recognize that 7 in 700is 10 times bigger than the 7 in 70 because 700 ÷ 70 = 10 and 70 x 10 = 700.*

4.NBT.A.2 - Read and write multi-digit whole numbers (less than or equal to 1,000,000) using standard form, word form, and expanded form (e.g., the expanded form of 4256 is written as 4 x 1000 + 2 x 100 + 5 x 10 + 6 x 1). Compare two multi-digit numbers based on meanings of the digits in each place and use the symbols >, =, and < to show the relationship.

4.NBT.A.3 - Round multi-digit whole numbers to any place (up to and including the hundred-thousand place) using understanding of place value.

4.NBT.B – Use place value understanding and properties of operations to perform multi-digit arithmetic.

4.NBT.B.4 - Fluently add and subtract within 1,000,000 using appropriate strategies and algorithms.

4.NBT.B.5 - Multiply a whole number of up to four digits by a one-digit whole number and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

4.NBT.B.6 - Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

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Number and Operations—Fractions (NF)

Limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, 100.

4.NF.A – Extend understanding of fraction equivalence and comparison.

4.NF.A.1 - Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{(n \cdot a)}{(n \cdot b)}$ or $\frac{(n \div a)}{(n \div b)}$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

4.NF.A.2 - Compare two fractions with different numerators and different denominators by creating common denominators or common numerators or by comparing to a benchmark fraction such as $\frac{1}{2}$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Use the symbols >, =, and < to show relationship and justify conclusions

4.NF.B – Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

4.NF.B.3 - Understand a fraction $\frac{a}{b}$ with *a* > 1 as a sum of fractions $\frac{1}{b}$. *For example*, $\frac{4}{5} = \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5}$.

4.NF.B.3a - Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

4.NF.B.3b - Decompose a fraction into a sum of fractions with the same denominator in more than one way (e.g., $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8}; \frac{3}{8} = \frac{1}{8} + \frac{2}{8}; 2\frac{1}{8} = 1 + 1 + \frac{1}{8} = \frac{8}{8} + \frac{8}{8} + \frac{1}{8}$), recording each decomposition by an equation. Justify decompositions by using a visual fraction model.

4.NF.B.3c - Add and subtract mixed numbers with like denominators by replacing each mixed number with an equivalent fraction and/or by using properties of operations and the relationship between addition and subtraction.

4.NF.B.3d - Solve contextual problems involving addition and subtraction of fractions referring to the same whole and having like denominators.

4.NF.B.4 - Apply and extend previous understandings of multiplication as repeated addition to multiply a whole number by a fraction.

4.NF.B.4a - Understand a fraction $\frac{a}{b}$ as a multiple of $\frac{1}{b}$. *For example, use a visual fraction model to represent* $\frac{5}{4}$ *as the product of 5 x* $\frac{1}{4}$*, recording the conclusion by the equation* $\frac{5}{4} = 5 \; x \; \frac{1}{4}$.

4.NF.B.4b - Understand a multiple of $\frac{a}{b}$ as a multiple of $\frac{1}{b}$ and use this understanding to multiply a whole number by a fraction. *For example, use a visual fraction model to express* $3 \; x \; \frac{2}{5}$ *as* $6 \; x \; \frac{1}{5}$*, recognizing this product as* $\frac{6}{5}$. (*In general,* $n \; x \; \frac{a}{b} = \frac{(n \; x \; a)}{b}$*).*

4.NF.B.4c - Solve contextual problems involving multiplication of a whole number by a fraction (e.g., by using visual fraction models and equations to represent the problem). *For example, if each person at a party will eat* $\frac{3}{8}$ *of a pound of roast beef, and there will be 4 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

4.NF.C – Understand decimal notation for fractions and compare decimal fractions.

4.NF.C.5 - Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express,* $\frac{3}{10}$ *as* $\frac{30}{100}$ *and add* $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$.

4.NF.C.6 - Read and write decimal notation for fractions with denominators 10 or 100. Locate these decimals on a number line.

4.NF.C.7 - Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Use the symbols >, =, or < to show the relationship and justify conclusions.

Department of Education

5th Grade

Number and Operations in Base Ten (NBT)

5.NBT.A – Understand the place value system.

5.NBT.A.1 - Recognize 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 1/10 of what it represents in the place to its left.

5.NBT.A.2 - Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

5.NBT.A.3 - Read and write decimals to thousandths using standard form, word form, and expanded form (e.g., the expanded form of 347.392 is written as 3 x 100 + 4 x 10 + 7 x 1 + 3 x (1/10) + 9 x (1/100) + 2 x (1/1000)). Compare two decimals to thousandths based on meanings of the digits in each place and use the symbols >, =, and < to show the relationship.

5.NBT.A.4 - Round decimals to the nearest hundredth, tenth, or whole number using understanding of place value.

5.NBT.B – Perform operations with multi-digit whole numbers and with decimals to hundredths.

5.NBT.B.5 - Fluently multiply multi-digit whole numbers (up to three-digit by four-digit factors) using appropriate strategies and algorithms.

5.NBT.B.6 - Find whole-number quotients and remainders of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

5.NBT.B.7 - Add, subtract, 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 operations; assess the reasonableness of answers using estimation strategies. (Limit division problems so that either the dividend or the divisor is a whole number.)

Number and Operations - Fractions (NF)

5.NF.A – Use equivalent fractions as a strategy to add and subtract fractions.

5.NF.A.1 - Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example,* $\frac{2}{3}+\frac{5}{4}=\frac{8}{12}+\frac{15}{12}=\frac{23}{12}$. *(In general,* $\frac{a}{b}+\frac{c}{d}=\frac{(ad+bc)}{bd}$ *.)*

5.NF.A.2 - Solve contextual problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result* $\frac{2}{5}+\frac{1}{2}=\frac{3}{7}$ *by observing that* $\frac{3}{7}<\frac{1}{2}$.

Tennessee Mathematics Standards and the Instructional Focus Documents can be found here.

5.NF.B – Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

5.NF.B.3 - Interpret a fraction as division of the numerator by the denominator ($\frac{a}{b} = a \div b$). *For example,* $\frac{3}{4}$ *= 3 ÷ 4 so when 3 wholes are shared equally among 4 people each person has a share of size* $\frac{3}{4}$*.* Solve contextual problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers by using visual fraction models or equations to represent the problem. *For example, if 8 people want to share 49 sheets of construction paper equally, how many sheets will each person receive? Between what two whole numbers does your answer lie?*

5.NF.B.4 - Apply and extend previous understandings of multiplication to multiply a fraction by a whole number or a fraction by a fraction.

5.NF.B.4a - Interpret the product $\frac{a}{b} x\ q$ as *a* x (*q* ÷ *b*) (partition the quantity *q* into *b* equal parts and then multiply by *a*). Interpret the product $\frac{a}{b} x\ q$ as (*a x q)* ÷ *b* (multiply *a* times the quantity *q* and then partition the product into *b* equal parts). *For example, use a visual fraction model or write a story context to show that* $\frac{2}{3}\ x\ 6$ *can be interpreted as 2 x (6 ÷ 3) or (2x 6) ÷ 3. Do the same with* $\frac{2}{3} x \frac{4}{5} = \frac{8}{15}$*. (In general,* $\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$*)*

5.NF.B.4b - 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. Multiply fractional side lengths to find areas of rectangles and represent fraction products as rectangular areas.

5.NF.B.5 - Interpret multiplication as scaling (resizing).

5.NF.B.5a - Compare 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. *For example, know if the product will be greater than, less than, or equal to the factors.*

5.NF.B.5b - Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explain why multiplying a given number by a fraction less than 1 results in a product less than the given number; and relate the principle of fraction equivalence $\frac{a}{b} = \frac{(a\ x\ n)}{(b\ x\ n)}$ to the effect of multiplying $\frac{a}{b}$ by 1.

5.NF.B.6 - Solve real world problems involving multiplication of fractions and mixed numbers by using visual fraction models or equations to represent the problem.

5.NF.B.7 - Apply and extend previous understandings of division to divide unit fractions and mixed numbers by whole numbers and whole numbers by unit fractions.

5.NF.B.7a - Interpret division of a unit fraction by a non-zero whole number and compute such quotients. *For example, use visual models and the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) x 4 = 1/3.*

5.NF.B.7b - Interpret division of a whole number by a unit fraction and compute such quotients. *For example, use visual models and the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 x (1/5) = 4.*

5.NF.B.7c - Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share $\frac{1}{2}$ lb of chocolate equally? How many $\frac{1}{3}$ cup servings are in 2 cups of raisins?*

Measurement and Data (MD)

5.MD.C – Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

5.MD.C.3 - Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

5.MD.C.3a - Understand that 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.

5.MD.C.3b - Understand that a solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.

5.MD.C.4 - Measure volumes by counting unit cubes, using cubic centimeters, cubic inches, cubic feet, and improvised units.

5.MD.C.5 - Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume of right rectangular prisms.

5.MD.C.5a - Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent whole-number products of three factors as volumes, *(e.g. to represent the associative property of multiplication.)*

5.MD.C.5b - Know and apply the formulas $V = l \times w \times h$ and $V = B \times h$ (where B represents the area of the base) for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems.

5.MD.C.5c - Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems.

Department of Education

6th Grade

Ratios and Proportional Relationships (RP)

6.RP.A – Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.A.1 - Understand the concept of a ratio and use ratio language to describe a relationship between two quantities. *For example, the ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak. Another example could be for every vote candidate A received, candidate C received nearly three votes.*

6.RP.A.2 - Understand the concept of unit rate *a/b* associated with a ratio *a:b* with *b ≠ 0*. Use rate language in the context of a ratio relationship. *For example, this recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is ¾ cup of flour for each cup of sugar. Also, we paid $75 for 15 hamburgers, which is a rate of $5 per hamburger.*

6.RP.A.3 - Use ratio and rate reasoning to solve real-world and mathematical problems (e.g. by reasoning about tables of equivalent ratios, tape diagrams, double number line diagram, or equations).

6.RP.A.3a - Make tables of equivalent ratios relating quantities with whole-number measurements, find the missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

6.RP.A.3b - Solve unit rate problems including those involving unit pricing and constant speed. *For example, if a runner ran 10 miles in 90 minutes, running at that speed, how long will it take him to run 6 miles? How fast is he running in miles per hour?*

6.RP.A.3c - Find a percent of a quantity as a rate per 100 (e.g. 30% of a quantity means $\frac{30}{100}$ times the quantity); solve problems involving finding the whole, given a part and the percent.

6.RP.A.3d - Use ratio reasoning to convert customary and metric measurement units (within the same system); manipulate and transform units appropriately when multiplying or dividing quantities.

The Number System (NS)

6.NS.A – Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

6.NS.A.1 - Interpret and compute quotients of fractions, and solve contextual problems involving division of fractions by fractions (e.g., using visual fraction models and equation to represent the problem is suggested). *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 times 8/9 is 2/3 ((a/b) ÷ (c/d) = ad/bc.) Further example: How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*

6.NS.B – Compute fluently with multi-digit numbers and find common factors and multiples.

6.NS.B.2 - Fluently divide multi-digit numbers using a standard algorithm.

6.NS.B.3 - Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each operation.

6.NS.B.4 - Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express 36 + 8 as 4 (9 + 2).

6.NS.C – Apply and extend previous understandings of numbers to the system of rational numbers.

6.NS.C.5 - Understand positive and negative numbers are used together to describe quantities having opposite directions or values (e.g. temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

6.NS.C.6 - Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

6.NS.C.6a - Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself*, For example,* $-(-3) = 3$*, and that 0 is its own opposite.*

6.NS.C.6b - Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

6.NS.C.6c - Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

6.NS.C.7 - Understand ordering and absolute value of rational numbers.

6.NS.C.7a - Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret* $(-3) > (-7)$ *as a statement that –3 is located to the right of –7 on a number line oriented from left to right.*

6.NS.C.7b - Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write* $(-3℃) > (-7℃)$ *to express the fact that* $-3℃$ *is warmer than* $-7℃$*.*

6.NS.C.7c - Understand the absolute value of a rational number as its distance from 0 on the number line and distinguish comparisons of absolute value from statements about order in a real-world context. *For example, for an account balance of -24 dollars represents a greater debt than an account balance -14 dollars because -24 is located to the left of -14 on the number line.*

6.NS.C.8 - Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Tennessee Mathematics Standards and the Instructional Focus Documents can be found here.

TN Department of Education

Expressions and Equations (EE)

6.EE.A – Apply and extend previous understandings of arithmetic to algebraic expressions.

6.EE.A1 - Write and evaluate numerical expressions involving whole-number exponents.

6.EE.A.2 - Write, read, and evaluate expressions in which variables stand for numbers.

6.EE.A.2a - Write expressions that record operations with numbers and with variables. *For example, express the calculation "Subtract y from 5" as 5 – y.*

6.EE.A.2b - Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression* $2(8+7)$ *as a product of two factors; view* $(8+7)$ *as both a single entity and a sum of two terms.*

6.EE.A.2c - Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

6.EE.A.3 - Apply the properties of operations (including, but not limited to, commutative, associative, and distributive properties) to generate equivalent expressions. The distributive property is prominent here. *For example, apply the distributive property to the expression* $3(2+x)$ *to produce the equivalent expression* $6+3x$*; apply the distributive property to the expression 24x + 18 y to produce the equivalent expression 6 (4x +3y); apply properties of operations to* $y+y+y$ *to produce the equivalent expression 3y.*

6.EE.A.4 - Identify when expressions are equivalent (i.e., when the expressions name the same number regardless of which value is substituted into them). *For example, the expression 5b + 3b is equivalent to (5 + 3) b, which is equivalent to 8b.*

6.EE.B – Reason about and solve one-variable equations and inequalities.

6.EE.B.5 - Understand solving an equation or inequality is carried out by determining if any values from a given set make the equation or inequality true. Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

6.EE.B.6 - Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

6.EE.B.7 - Solve real-world and mathematical problems by writing and solving one-step equations of the form $x + p = q$ and $px = q$ for cases in which p, q, and x are all nonnegative rational numbers.

6.EE.B.8 - Interpret and write an inequality of the form $x > c$ or $x < c$ which represents a condition or constraint in a real-world or mathematical problem. Recognize that inequalities have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

6.EE.C – Represent and analyze quantitative relationships between dependent and independent variables.

6.EE.C.9 - Use variables to represent two quantities in a real-world problem that change in relationship to one another. *For example, Susan is putting money in her savings account by depositing a set amount each week (50). Represent her savings account balance with respect to the number of weekly deposits (s = 50w, illustrating the relationship between balance amount s and number of weeks w).*

6.EE.C.8a - Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable

6.EE.C.8b - Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

Department of Education

7th Grade

Ratios and Proportional Relationships (RP)

7.RP.A – Analyze proportional relationships and use them to solve real-world and mathematical problems.

7.RP.A.1 - Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks* $\frac{1}{2}$ *mile in each* $\frac{1}{4}$ *hour, compute the unit rate as the complex fraction* $\frac{\frac{1}{2}}{\frac{1}{4}}$ *miles per hour equivalently 2 miles per hour.*

7.RP.A.2 - Recognize and represent proportional relationships between quantities.

7.RP.A.2a - Decide whether two quantities are in a proportional relationship, (e.g. by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin).

7.RP.A.2b - Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

7.RP.A.2c - Represent proportional relationships by equations. *For example, if total cost* t *is proportional to the number* n *of items purchased at a constant price* p*, the relationship between the total cost and the number of items can be expressed as* t=pn*.*

7.RP.A.2d - Explain what a point (*x, y*) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r*) where *r* is the unit rate.

7.RP.3 - Use proportional relationships to solve multi-step ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.*

The Number System (NS)

7.NS.A – Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

7.NS.A.1 - Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

7.NS.A.1a - Describe situations in which opposite quantities combine to make 0.

7.NS.A.1b - Understand $p + q$ as the number located a distance $|q|$ from *p*, in the positive or negative direction depending on whether *q* is positive or negative. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

7.NS.A.1c - Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

Tennessee Mathematics Standards and the Instructional Focus Documents can be found here.

7.NS.A.1d - Apply properties of operations as strategies to add and subtract rational numbers.

7.NS.A.2 - Apply and extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers.

7.NS.A.2a - Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

7.NS.A.2b - Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers, then, $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.

7.NS.A.2c - Apply properties of operations as strategies to multiply and divide rational numbers.

7.NS.A.2d - Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

7.NS.A.3 - Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)

Expressions and Equations (EE)

7.EE.A – Use properties of operations to generate equivalent expressions.

7.EE.A.1 - Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with integer coefficients.

7.EE.A.2 - Understand that rewriting an expression in different forms in a contextual problem can provide multiple ways of interpreting the problem and how the quantities in it are related. *For example, shoes are on sale at a 25% discount. How is the discounted price* P *related to the original cost* C *of the shoes?* C – 25C *can be written as* .75C.

7.EE.B – Solve real-life and mathematical problems using numerical and algebraic expressions and equations and inequalities.

7.EE.B.3 - Solve multi-step real-world and mathematical problems posed with positive and negative rational numbers presented in any form (whole numbers, fractions, and decimals).

7.EE.B.3a - Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate.

7.EE.B.3b - Assess the reasonableness of answers using mental computation and estimation strategies.

7.EE.B.4 - Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

7.EE.B.4a - Solve contextual problems leading to equations of the form $px + q = r$, and $p(x + q) = r$ where *p, q,* and *r* are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*

7.EE.B.4b - Solve contextual problems leading to inequalities of the form $px + q > r$ or $px + q < r$ where *p*, *q*, and *r* are specific rational numbers. Graph the solution set of the inequality on a number line and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.* (Note the inequalities using >, <, ≤, ≥ are included in this standard).

Department of Education

8th Grade

Expressions and Equations (EE)

8.EE.A – Work with radicals and integer exponents.

8.EE.A.1 - Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 2^{-5} = 3^{-3} = 1/3^3 = 1/27$.*

8.EE.A.2 - Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where *p* is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

8.EE.A.3 - Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.*

8.EE.A.4 - Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g. use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

8.EE.B – Understand the connections between proportional relationships, lines, and linear equations.

8.EE.B.5 - Graph proportional relationships, interpreting its unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*

8.EE.B.6 - 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; know and derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis *b*.

8.EE.C – Analyze and solve linear equations and systems of two linear equations.

8.EE.C.7 - Solve linear equations in one variable.

8.EE.C.7a - Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where *a* and *b* are different numbers).

8.EE.C.7b - Solve linear equations with rational coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8.EE.C.8 - Analyze and solve systems of two linear equations.

8.EE.C8a - Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

8.EE.C8b - Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example,* 3x + 2y = 5 *and* 3x + 2y =6 *have no solution because* 3x + 2y *cannot simultaneously be* 5 *and* 6.

8.EE.C.8c - Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*

Functions (F)

8.F.A – Define, evaluate, and compare functions.

8.F.A.1 - Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in 8th grade.)

8.F.A.2 - Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*

8.F.A.3 - Know and interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function* A = s^2 *giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.*

8.F.B – Use functions to model relationships between quantities.

8.F.B.4 - Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x*, *y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.

8.F.B.5 - Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g. where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Geometry (G)

8.G.B – Understand and apply the Pythagorean Theorem.

8.G.B.4 - Explain a proof of the Pythagorean Theorem and its converse.

8.G.B.5 - Know and apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8.G.B.6 - Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Tennessee Mathematics Standards and the Instructional Focus Documents can be found here.