2024 Upper Math Montessori Alignment Guide

Numerical Reasoning

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Understanding value (place, absolute, and rounding) in the decimal system	To give students visual representations of the growth of the numbers when multiplied or divided by ten and moving through the place value periods	• Multiplication Checkerboard • Decimal Checkerboard • Bead Bars • Number Tiles • Bank Game review • Decimal Fraction Board • Decimal Checkerboard	4.PAFR.1.2 Compute the product of a one-digit whole number times a multiple of 10 (from 10 to 90) and 100 (from 100 to 900) based on place value and properties of operations. 5.NR.1.2 Explain how the value of a digit in a multidigit number changes if the digit moves one or more places to the left or right in the base ten system. Include decimals to the thousandths place. 5.NR.1.3 Round decimal numbers up to 999 with decimals to the thousandths place to the nearest hundredth, tenth, or whole numbers. 5.NR.1.4 Use patterns to explain the exponents when multiplying and dividing by powers of 10, not to exceed the thousandths place. 4.NSBT.1. Understand that, in a multi-digit whole number, a digit represents ten times what the same digit represents in the place to its right. 5.NSBT.1 Understand that, in a multi-digit whole number, a digit in one place represents 10 times what the same digit represents in the place to its right and represents 1/10 times what the same digit represents in the place to its left.

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			5.NSBT.1 Understand that, in a multi-digit whole number, a digit in one place represents 10 times what the same digit represents in the place to its right, and represents 1/10 times what the same digit represents in the place to its left. 5.NBST.2 Use whole number exponents to explain: a. patterns in the number of zeroes of the product when multiplying a number by powers of 10; patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
	To give students visual representations of large whole numbers and decimal numbers; to provide opportunities for the child to practice building, reading, writing, ordering, and comparing large whole numbers and decimal numbers	• Multiplication Checkerboard • Decimal Checkerboard • Bead Bars • Number Tiles • Racks and Tubes • Decimal Fraction Board	4.NR.1.1 Read and write whole numbers through the millions period (0 to 999,999,999) in word, standard, and equations in expanded form. 4.NR.1.3 Order whole numbers within 999,999 (no more than 3) in ascending or descending order and record the comparison(s) using symbols for is less than (<) and/or is greater than (>). 4.NR.2.2 Compare decimal numbers to the hundredths using the benchmarks 0, 0.5, and 1.0, concrete area, and linear models. Use the symbols for is equal to (=), is less than (<), and/or is greater than (>). 5.NR.1.1 Read, write, and represent multi-digit numbers from 0 to 999 with decimals to the thousandths place. Use pictorial, word, standard, or expanded form with fraction or decimal notation. 4.NSBT.2. Recognize math periods and number patterns within each period to read and write in standard form large numbers through 999,999,999. 5.NBST.2 Use whole number exponents to explain: a. patterns in the number of zeroes of the product when multiplying a number by powers of 10; b. patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. 5.NSBT.3 Read and write decimals in standard and expanded form. Compare two decimal numbers to the thousandths using the symbols >, =, or <.

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	To give students visual representations of comparing, ordering, and finding absolute value of rational numbers; to provide opportunities for the child to practice comparing, ordering, and finding absolute value of rational numbers	● Integer Number Line ● Elementary Negative Snake Game ● Integers: Signed Numbers (Oral Introduction) ● Negative Snake Concrete ● Negative Snake with Notation	6.PAFR.3.3 Identify the additive inverse of a number and add additive inverses to find their sum is equal to zero. 6.NS.5 Understand that the positive and negative representations of a number are opposites in direction and value. Use integers to represent quantities in real-world situations and explain the meaning of zero in each situation 6.NS.7 Understand and apply the concepts of comparing, ordering, and finding absolute value to rational numbers. a. Interpret statements using equal to (=) and not equal to (≠). b. Interpret statements using less than (<), greater than (>), and equal to (=) as relative locations on the number line. c. Use concepts of equality and inequality to write and to explain real-world and mathematical situations. d. Understand that absolute value represents a number's distance from zero on the number line and use the absolute value of a rational number to represent real world situations. e. Recognize the difference between comparing absolute values and ordering rational numbers. For negative rational numbers, understand that as the absolute value increases, the value of the quotient negative number decreases.
	To give students a visual representation of rounding whole and decimal numbers; to provide opportunities for the child to practice rounding whole and decimal numbers	● Bank Game ● Decimal Fraction Board ● Decimal Stamp Game ● Stamp Game	4.NR.1.2 Estimate sums, differences, products, and quotients of multi-digit whole numbers, using rounding and place value to determine the reasonableness of real-world problem solutions. Write an equation for the estimate. 4.NSBT.3. Use rounding as one form of estimation and round whole numbers to any given place value.

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			5.NSBT.4 Round decimals to any given place value within thousandths.
Systems of Numeration	To give students a visual representation of other systems of numeration; to help students gain understanding of other systems of numeration	• Psychological Presentation • Systems of Numeration (Concept, Number Rods and Wooden Rods) • First Law of any System (Decimal System and Systems Below Base Ten, Bases Eleven and Twelve) • Sandpaper Numerals (Base Ten or Less) • Non-decimal Systems (Duodecimal System) • Number Rods and Numerals (Bases Ten and Under; Bases Greater Than Ten) • Digit Board (Systems One at a Time/Out of Order; All Systems Together) • Two Voices/Two Systems (Hundred Chain Introduction) • Values of Numbers in Different Systems	*NO STANDARDS LISTED

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Building and decomposing numbers in the decimal system (factors and multiples)	To give students visual representations of factoring and multiples; to provide opportunities for the child to apply the distributive property and practice determining factors and multiples of numbers, including finding GCF and LCM	• Sum x Sum sequence • Algebraic Peg Board (review) • Decanomial Bead Bar Box and Equation Box (review)	5.PAFR.3.1 Determine the least common multiple (LCM) to find a common denominator. Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100. 5.PAFR.3.2 Determine the greatest common factor (GCF) of two numbers both less than or equal to 50 to simplify a fraction into its standard form. 6.NS.4 Find common factors and multiples using two whole numbers. a. Compute the greatest common factor (GCF) of two numbers both less than or equal to 100. b. Compute the least common multiple (LCM) of two numbers both less than or equal to 12. c. Express sums of two whole numbers, each less than or equal to 100, using the distributive property to factor out a common factor of the original addends.

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Operations with whole and decimal numbers	To give students visual representations of addition and subtraction with multi-digit whole and decimal numbers; to provide opportunities for the child to practice addition and subtraction with multi-digit whole and decimal numbers	• Stamp Game and Bead Frame (review only) • Decimal Fraction Board • Decimal Stamp Game	4.PAFR.1.1 Use a strategy to accurately compute sums and differences of whole numbers up to 100,000 and justify the sum or difference. 5.PAFR.1.1 Use a strategy to compute the product of a two- or three-digit factor times a two-digit factor to include real-world situations. 5.PAFR.1.3 Use a strategy to compute sums and differences of decimal numbers to the hundredths. 5.PAFR.1.4 Use a strategy to multiply a one-digit whole number by a decimal to the hundredths and divide a decimal to the hundredths (dividend) by a one-digit whole number (divisor). Justify the calculation. 6.PAFR.3.7 Add, subtract, multiply, and divide multi digit positive decimals, up to the thousandths place, to solve problems in mathematical and real-world situations. 4.NSBT.4 Fluently add and subtract multi-digit whole numbers using strategies to include a standard algorithm. 5.NSBT.7 Add, subtract, multiply, and divide decimal numbers to hundredths using concrete area models and drawings.to give students a visual representation and provide opportunities for the child to practice decimal functions with materials if needed. 6.NS.3 Fluently add, subtract, multiply and divide multi-digit decimal numbers using a standard algorithmic approach.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
	To give students visual representations of multiplication with whole and decimal numbers; to provide opportunities for the child to practice multiplication with whole and decimal numbers, including squaring and cubing	• Multiplication Checkerboard and Decimal Checkerboard • Bead Bars • Number Tiles and Golden Bead Frame • Squaring Sequence: Transition (Binomial) • Hierarchical (Golden Beads) • Hierarchical (Pegboard--Intro, Binomial, Trinomial, Special Cases, Geometric Extension) • Decimal Checkerboard	4.PAFR.1.3 Decompose numbers by the value of each digit to multiply whole numbers up to four digits by a one-digit number and two 2- digit whole numbers. 5.PAFR.1.1 Use a strategy to compute the product of a two- or three-digit factor times a two-digit factor to include real-world situations. 4.NSBT.5. Multiply up to a four-digit number by a one-digit number and multiply a two-digit number by a two-digit number using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using rectangular arrays, area models and/or equations. 5.NSBT.5 Fluently multiply multi-digit whole numbers using strategies to include a standard algorithm. 5.NSBT.7 Add, subtract, multiply, and divide decimal numbers to hundredths using concrete area models and drawings. 6.NS.3 Fluently add, subtract, multiply and divide multi-digit decimal numbers using a standard algorithmic approach.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
	To give students visual representations of division with whole and decimal numbers; to provide opportunities for the child to practice division with whole and decimal numbers	• Review with Golden Beads • Stamp Game • Racks and Tubes (Test Tube Division) • Decimal Stamp Game	4.PAFR.1.3 Decompose numbers by the value of each digit to multiply whole numbers up to four digits by a one-digit number and two 2- digit whole numbers. 4.PAFR.1.4 Use a strategy to divide up to a four-digit dividend by a one-digit divisor, with and without remainders. Justify the calculation. 5.PAFR.1.2 Use a strategy to compute the quotient of a multi- digit whole number dividend divided by a two-digit whole number divisor, with and without remainders, to include real- world situations. Limit the dividend to four digits. 4.NSBT.6. Divide up to a four-digit dividend by a one-digit divisor using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. 5.NSBT.6 Divide up to a four-digit dividend by a two-digit divisor, using strategies based on place value, the properties of operations, and the relationship between multiplication and division. 5.NSBT.7 Add, subtract, multiply, and divide decimal numbers to hundredths using concrete area models and drawings. 6.NS.2 Fluently divide multi-digit whole numbers using a standard algorithmic approach. 6.NS.3 Fluently add, subtract, multiply and divide multi-digit decimal numbers using a standard algorithmic approach.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Developing and applying an understanding of fraction equivalence and comparisons	To give students a variety of models for visualizing equivalent fractions to expand their understanding of fractions; to specifically support student understanding that fractions represent division; to understand how to compute division as represented by positive fractions	• Metal Fraction Insets/Fraction Box • Fraction Circles • Metal Squares • Constructive Triangles • Fraction pieces halves through twenty-fourths • graphing paper and pencil modeling • Teacher-made materials	4.NR.2.3 Generate equivalent fractions, including fractions greater than 1, using multiple representations. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100. 5.PAFR.3.1 Determine the least common multiple (LCM) to find a common denominator. Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100. 5.PAFR.3.2 Determine the greatest common factor (GCF) of two numbers both less than or equal to 50 to simplify a fraction into its standard form. 4.NSF.1. Explain why a fraction (i.e., denominators 2, 3, 4, 5, 6, 8, 10, 12, 25, 100), aa/bb , is equivalent to a fraction, $nn \times aa/nn \times bb$, 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. 5.NSF.3 Understand the relationship between fractions and division of whole numbers by interpreting a fraction as the numerator divided by the denominator (i.e., $aabb = aa \div bb$). 5.NS.1 Compute and represent quotients of positive fractions using a variety of procedures (e.g., visual models, equations, and real-world situations).

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	To give students experience with fraction comparisons	● Fraction Circles Box ● Metal Fraction Insets ● Metal Squares ● Multiplication Control Board	4.NR.2.5 Explain and demonstrate how a mixed number is equivalent to a fraction greater than 1 and how a fraction greater than 1 is equivalent to a mixed number. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100. 4.NR.2.6 Compare fractions and mixed numbers with like and unlike denominators applying benchmark fractions such as 0, 1 2 , and 1 using the symbols for is equal to (=), is less than (<), or is greater than (>). Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100. 5.NR.2.1 Compare fractions and mixed numbers with like and unlike denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, and 100 using equivalence to create a common denominator. Use the symbols for is less than (<), is more than (>), or is equal to (=) to record the comparison. 4.NSF.2. Compare two given fractions (i.e., denominators 2, 3, 4, 5, 6, 8, 10, 12, 25, 100) by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2 and represent the comparison using the symbols >, =, or <.
	To help students see the connection between fractions and decimals; to specifically support student understanding that tenths can be expressed as equivalent hundredths	● Metal Squares ● Centesimal Frame ● Decimal Board and Cards ● Decimal Stamp Game ● Metal Squares ● Centesimal Frame ● Decimal Board and Cards ● Decimal Stamp Game	4.NR.2.1 Represent fractions with denominators of 10 and 100 in words, models, and decimal notations. 4.NSF.5. Express a fraction with a denominator of 10 as an equivalent fraction with a denominator of 100 and use this technique to add two fractions with respective denominators of 10 and 100. 4.NSF.6. Write a fraction with a denominator of 10 or 100 using decimal notation and read and write a decimal number as a fraction.

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	To help students see the relative value of decimal numbers	• Decimal Board and Cards • Wooden Hierarchical Materials • Decimal Stamp Game	4.NR.2.2 Compare decimal numbers to the hundredths using the benchmarks 0, 0.5, and 1.0, concrete area, and linear models. Use the symbols for is equal to (=), is less than (<), and/or is greater than (>). 4.NSF.7. Compare and order decimal numbers to hundredths and justify using concrete and visual models.

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Operations with fractions	To help students gain facility with solving real-world problems using fraction addition and subtraction	• Fraction Circles • Metal Squares • Multi-step word problem task cards	4.NR.2.4 Represent the composition and decomposition of fractions with the same denominator, including mixed numbers and fractions greater than 1, using multiple representations. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100. 4.NR.2.5 Explain and demonstrate how a mixed number is equivalent to a fraction greater than 1 and how a fraction greater than 1 is equivalent to a mixed number. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100. 4.PAFR.2.1 Use a strategy to accurately compute sums and differences of fractions with like denominators and justify the reasonableness of the answer. Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12, 25, and 100. 5.PAFR.2.1 Use a strategy to compute sums and differences of fractions and mixed numbers with unlike denominators and justify the sum or difference to include real-world situations. Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100. 6.PAFR.3.6 Add, subtract, multiply, and divide positive fractions, including mixed numbers in mathematical and real- world situations. 4.NSF.3. Develop an understanding of addition and subtraction of fractions (i.e., denominators 2, 3, 4, 5, 6, 8, 10, 12, 25, 100) based on unit fractions. a. Compose and decompose a fraction in more than one way, recording each composition and decomposition as an addition or subtraction equation; b. Add and subtract mixed numbers with like denominators; c. Solve real-world problems involving addition and subtraction of fractions referring to the same whole and having like denominators. 5.NSF.1 Add and subtract fractions with unlike denominators (including mixed numbers) using a variety of models, including an area model and number line.

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			5.NSF.2 Solve real-world problems involving addition and subtraction of fractions with unlike denominators. 4.PAFR.2.3 Represent and compute the product of a whole number times a unit fraction. Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12, 25, and 100. 4.PAFR.2.2 Use a strategy to multiply a fraction by a fraction or a fraction by a whole to include real-world situations. Limit denominators to 2, 3, 4, 5, 6, 8, 10, and 12. 4.PAFR.3.2 Identify the multiplicative inverse of a number and multiply multiplicative inverses to find their product is equal to 1. 4.NSF.4. Apply and extend an understanding of multiplication by multiplying a whole number and a fraction (i.e., denominators 2, 3, 4, 5, 6, 8, 10, 12, 25, 100). a. Understand a fraction aa/bb as a multiple of 1/bb; b. Understand a multiple of aa/bb as a multiple of 1/bb, and use this understanding to multiply a fraction by a whole number; c. Solve real-world problems involving multiplication of a fraction by a whole number (i.e., use visual fraction models and equations to represent the problem). 5.NSF.4 Extend the concept of multiplication to multiply a fraction or whole number by a fraction. d. Recognize the relationship between multiplying fractions and finding the areas of rectangles with fractional side lengths; e. Interpret multiplication of a fraction by a whole number and a whole number by a fraction and compute the product; f. Interpret multiplication in which both factors are fractions less than one and compute the product

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	To help students gain facility with solving real-world problems using fraction multiplication	• Fraction Circles • Fraction Puzzle Board • Metal Fraction Squares	4.PAFR.2.3 Represent and compute the product of a whole number times a unit fraction. Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12, 25, and 100. 4.PAFR.2.2 Use a strategy to multiply a fraction by a fraction or a fraction by a whole to include real-world situations. Limit denominators to 2, 3, 4, 5, 6, 8, 10, and 12. 4.PAFR.3.2 Identify the multiplicative inverse of a number and multiply multiplicative inverses to find their product is equal to 1. 5.NSF.4. Apply and extend an understanding of multiplication by multiplying a whole number and a fraction (i.e., denominators 2, 3, 4, 5, 6, 8, 10, 12, 25, 100). g. Understand a fraction aa/bb as a multiple of 1/bb; h. Understand a multiple of aa/bb as a multiple of 1/bb, and use this understanding to multiply a fraction by a whole number; i. Solve real-world problems involving multiplication of a fraction by a whole number (i.e., use visual fraction models and equations to represent the problem). 5.NSF.4 Extend the concept of multiplication to multiply a fraction or whole number by a fraction. j. Recognize the relationship between multiplying fractions and finding the areas of rectangles with fractional side lengths; k. Interpret multiplication of a fraction by a whole number and a whole number by a fraction and compute the product; l. Interpret multiplication in which both factors are fractions less than one and compute the product 5.NSF.5 Justify the reasonableness of a product when multiplying with fractions. a. Estimate the size of the product based on the size of the two factors; b. Explain why multiplying a given number by a number greater than 1 (e.g., improper fractions, mixed numbers, whole numbers) results in a product larger than the given number; c. Explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number;

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			d. Explain why multiplying the numerator and denominator by the same number has the same effect as multiplying the fraction by 1. 5.NSF.6 Solve real-world problems involving multiplication of a fraction by a fraction, improper fraction and a mixed number.
	To help students gain facility with solving real-world problems using fraction division	• Teacher-made task cards	4.PAFR.2.4 Interpret a fraction as an equal sharing division situation, where a quantity (the numerator) is divided into equal parts (the denominator) to include real-world situations. 4.PAFR.2.3 Interpret and represent division of a whole number dividend by a unit fraction divisor and a unit fraction dividend by a whole number divisor and apply to real-world situations. Limit denominators to 2, 3, 4, 5, 6, 8, 10, and 12. 5.NSF.7 Extend the concept of division to divide unit fractions and whole numbers by using visual fraction models and equations. a. Interpret division of a unit fraction by a non-zero whole number and compute the quotient; b. Interpret division of a whole number by a unit fraction and compute the quotient. 5.NSF.8 Solve real-world problems involving division of unit fractions and whole numbers, using visual fraction models and equations.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Understanding ratios, rates, and proportional relationships, including Pythagorean equivalents and the probability of chance events.	To give students visual representations of ratios, rates, and percentages; to provide opportunities for the child to apply the concepts of ratios, rates, and percentages; to provide opportunities for the child to problem solve using the concepts of ratios, rates, and percentages; to provide opportunities for students to explore Pythagorean equivalents as a type of proportional relationship	• Algebraic Peg Board • Ratio/Proportion sequence (Terminology and Concept) • Peg Board Introduction • Ratio as a Fraction • Ratio in Problem Solving • Proportion • Equivalency Materials(Powers of Two) • Teacher created task cards • Plate I: Sensorial • Plate II Numeric • Plate III: Euclidian Logic	4.DPSR.2.1 Determine the possible outcomes of a simple event and record the probability as certain, possible, or impossible. 4.DPSR.2.1 Represent the probability of a simple event as 0, a fraction, or 1. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 20, and 25. 4.DPSR.2.1 Given the probability of a random event, expressed as a number from 0 to 1, state the likelihood of the event occurring. 6.DPSR.2.2 Find the probability of simple events in mathematical and real-world situations. Limit denominators to 2, 4, 5, 8, 10, 25, 50, and 100. 6.DPSR.2.3 Given the probability of an event, identify and calculate the complement of that event. 6.PAFR.2.6 Interpret the concept of a ratio as the relationship between two quantities, including part-to-part and part-to- whole. 6.PAFR.2.7 Explain the relationship between ratios and rates, including unit rates. 6.PAFR.2.8 Solve ratio and rate problems in real world situations. 6.RP.1 Interpret the concept of a ratio as the relationship between two quantities, including part to part and part to whole. 6.RP.2 Investigate relationships between ratios and rates. a. Translate between multiple representations of ratios (i.e., *aabb*,*aa*:*bb*,*aa* to *bb*, visual models). b. Recognize that a rate is a type of ratio involving two different units. c. Convert from rates to unit rates. 6.RP.3 Apply the concepts of ratios and rates to solve real-world and mathematical problems.

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			a. Create a table consisting of equivalent ratios and plot the results on the coordinate plane. b. Use multiple representations, including tape diagrams, tables, double number lines, and equations, to find missing values of equivalent ratios. c. Use two tables to compare related ratios. d. Apply concepts of unit rate to solve problems, including unit pricing and constant speed. e. Understand that a percentage is a rate per 100 and use this to solve problems involving wholes, parts, and percentages. f. Solve one-step problems involving ratios and unit rates (e.g., dimensional analysis).

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Understanding the relationships between fractions, decimals, and percentages	To give students visual representations of equivalent fractions, decimals, and percentages; to provide opportunities for the child to practice with equivalencies among fractions, decimals, and percentages	• Fraction Boxes • Decimal Fraction Board • Centesimal Frame	4.PAFR.2.2 Use fraction and decimal equivalencies to add and subtract tenths and hundredths, to include mixed numbers and fractions greater than 1. 6.NR.1.1 Convert positive rational numbers into equivalent forms among terminating decimals, fractions (including mixed numbers), and percentages. Limit fractions to denominators of 2, 4, 5, 8, 10, 20, 25, 50, 100, and 200. NR.2.1 Compare two positive rational numbers and write statements using the symbols for is equal to (=), is not equal to (≠), is less than (<), and/or is greater than (>) in mathematical and real-world situations. Limit fractions to denominators of 2, 4, 5, 8, 10, 20, 25, 50, 100, and 200. 6.NR.2.2 Sort a set of positive rational numbers in ascending and/or descending order in mathematical and real-world situations. Limit sets to no more than 5 numbers. Limit fractions to denominators of 2, 4, 5, 8, 10, 20, 25, 50, 100, and 200. 6.NR.2.3 Represent quantities with integers in real world situations and explain the meaning of zero. 6.NR.2.4 Identify and compare the opposite value and absolute value of positive and negative rational numbers. 6.NS.9 Investigate and translate among multiple representations of rational numbers (fractions, decimal numbers, percentages). Fractions should be limited to those with denominators of 2, 3, 4, 5, 8, 10, and 100.

Patterns, Algebra, and Functional Reasoning

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Developing facility with expressions, equations, and word problems (all operations)	To help students understand how to create equations to show multiplicative comparisons	• Multiplication Checkerboard and Beads • Bead Bars • Decanomial Bead Material (Sum x Sum) • Materials for the Memorization of Multiplication Facts (Bingo Boards)	4.ATO.1. Interpret a multiplication equation as a comparison (e.g. interpret 35 = 5x7 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.
	To help students gain facility with multiplication and division when solving real-world problems	• Multiplication Checkerboard and Beads • Bead Bars • Decanomial Bead Material (Sum x Sum) • Materials for the Memorization of Multiplication & Division Facts (Bingo Boards)	4.PAFR.3.3 Solve real-world situations involving multiplicative comparison situations and write equations to represent the problem using a variable for the unknown. 4.ATO.2. Solve real-world problems using multiplication (product unknown) and division (group size unknown, number of groups unknown).
	To help students gain facility with using all operations to solve real-world problems	• Golden Bead materials • Stamp Game • Decanomial Bead Material (Sum x Sum) • Teacher-made task cards for practice	4.PAFR.3.3 Solve real-world situations involving multiplicative comparison situations and write equations to represent the problem using a variable for the unknown. 4.PAFR.3.4 Solve two-step, real-world situations using the four operations involving whole number answers. Represent the problem using an equation with a variable as the unknown in any position. 6.PAFR.3.5 Add, subtract, multiply, and divide integers in mathematical and real-world situations. 4.ATO.3. Solve multi-step, real-world problems using the four operations. Represent the problem using an equation with a variable as the unknown quantity.

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	To help students understand how to evaluate, translate, interpret, and write numerical expressions; to help students understand powers of numbers (exponents); to help students understand how to balance equations	• Yellow Triangle Area Material • Equivalent Figure Material • Tangrams • Geoboards • Constructive Triangles • Geometry Cabinet • Yellow Volume Material • Volume Boxes (250 and 1000 cubes) • Blue Geometric Shapes (solid and hollow) • Cubing material • Teacher-made task cards and extensions • Powers of Numbers Sequence • Powers of Numbers (Power of Two: Concrete, Notation, Terminology, Power of Three, Comparison of Powers, Powers of Ten) • Exponential Notation (Multiplication, Division) • Expanded Notation: Basic Operations (Format, Addition, Subtraction, Multiplication, Division, Scientific Notation) • Presentations (Addition,	5.PAFR.3.4 Translate a two-step real-world situation into a numerical expression using parentheses as grouping symbols and evaluate the expression. 6.PAFR.2.1 Identify parts of an algebraic expression using the mathematical terms *sum, difference, term, variable, product, factor, quotient, coefficient, and constant.* 6.PAFR.2.2 Write and evaluate numerical expressions containing powers. Limit to positive whole number bases and positive whole number exponents. 6.PAFR.2.3 Evaluate numerical expressions with positive whole number bases and positive whole number exponents using the Order of Operations. 6.PAFR.3.5 Add, subtract, multiply, and divide integers in mathematical and real-world situations. 5.ATO.1 Evaluate numerical expressions involving grouping symbols (i.e., parentheses, brackets, braces). 5.ATO.2 Translate verbal phrases into numerical expressions and interpret numerical expressions as verbal phrases. 6.EEI.1 Write and evaluate numerical expressions involving whole-number exponents and positive rational number bases using the Order of Operations. 6. EEI.2 Extend the concepts of numerical expressions to algebraic expressions involving positive rational numbers. a. Translate between algebraic expressions and verbal phrases that include variables. b. Investigate and identify parts of algebraic expressions using mathematical terminology, including term, coefficient, constant, and factor. c. Evaluate real-world and algebraic expressions for specific values using the Order of Operations. Grouping symbols should be limited to parentheses, braces, and brackets. Exponents should be limited to whole numbers.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
		Subtraction, Multiplication, Division) ● Solving for an Unknown (Addition, Subtraction, Multiplication, Division, Applied Word Problems)	
	To give students visual representations to help create and solve numerical expressions	● Equation Box ● Decanomial Bead Bars (review)	6.PAFR.2.4 Write and evaluate expressions using variables to represent quantities in mathematical and real-world situations. 6.PAFR.2.5 Write and solve one-step equations and inequalities with one variable involving positive rational numbers in mathematical and real-world situations. 6.PAFR.3.4 Apply the properties of operations to create equivalent algebraic expressions and justify the properties used. Limit properties to the Identity, Inverse, Commutative, Associative, and Distributive Properties. 6.EEI.3 Apply mathematical properties (e.g., commutative, associative, distributive) to generate equivalent expressions. 6.EEI.4 Apply mathematical properties (e.g., commutative, associative, distributive) to justify that two expressions are equivalent. 6.EEI.5 Understand that if any solutions exist, the solution set for an equation or inequality consists of values that make the equation or inequality true. 6.EEI.6 Write expressions function using variables to represent quantities in real-world and mathematical situations. Understand the meaning of the variable in the context of the situation. 6.EEI.7 Write and solve one-step linear equations in one variable involving non-negative rational numbers for real-world and mathematical situations.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
	To give students visual representations to help create and graph inequalities and graph independent/dependent variables	• Equation Box • Decanomial Bead Bars (review)	6.PAFR.1.1 Use tables, graphs, verbal descriptions, and equations to represent the relationship between independent functions and dependent variables of functions. 6.PAFR.1.2 Identify the independent and dependent variable of a function in mathematical and real-world situations. 6.PAFR.3.1 Represent the solutions of inequalities on a number line and explain that the solution set may contain an infinite number of solutions. Limited to the symbols for is less than (<) and is greater than (>). 6.EEI.8 Extend knowledge of inequalities used to compare numerical expressions to include algebraic expressions in real-world and mathematical situations. a. Write an inequality of the form $xx>cc$ or $xx<cc$ and graph the solution set on a number line. b. Recognize that inequalities have infinitely many solutions. 6.EEI.9 Investigate multiple representations of relationships in real-world and mathematical situations. a. Write an equation that models a relationship between independent and dependent variables. b. Analyze the relationship between independent and dependent variables using graphs and tables. c. Translate among graphs, tables, and equations.
Factoring prime and composite numbers	To help students understand prime and composite numbers	• Pegboard and Pegs • Multiplication Finger Charts • Sieve of Eratosthenes • Multiplication Bead Bars • Table of Pythagoras	4.PAFR.3.1 Find all factor pairs for a whole number in the range 1–50. Determine whether the whole number is prime or composite. 4.ATO.4. Recognize that a whole number is a multiple of each of its factors. Find all factors for a whole number in the range 1 – 100 and determine whether the whole number is prime or composite.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Square and Cube Roots	To give students visual representations of squares, cubes, square roots, and cube roots of numbers; to provide opportunities for practice with the concepts of squares, cubes, square roots, and cube roots of numbers.	• Algebraic Transformation (Binomial; Graph paper extension) • Rules for Squaring (Algebraic Transformation Pegboard; Binomial Cube lid; Trinomial Cube lid; Polynomials) • Squaring: Generalizations and Guide Squares (Pegboard; Guide Squares and Summation) • Square Root Sequence (Concept, Language, Notation; Golden Bead Material; Making the Periods) • Square Root Sequence: Pegboard (Pegboard; Introduction to Notation with Binomial; Introduction to Notation with Trinomial; Additional Notation; Square Roots with Zero) • Square Root: Abstraction (Building a Square by Periods; Formulating the Rule; Finalizing the Rule) • Cubing (Introduction/Review;	NO STANDARD LISTED

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
		Successive Passages; Successive Passages Notation; Non-successive Passages with Notation; Cubing a Binomial/Concrete; Cubing a Binomial/Numeric; Algebraic Notation; Algebraic Binomial Cube; Cubing a Trinomial/Wooden Material; Algebraic Trinomial Cube) ● Hierarchical Cube: Transition (Story of the Three Kings/Introduction; Story of the Three Kings/Numeric; Hierarchical Trinomial Cube; Hierarchical Cube Extension ● Cube Root (Concept, Language, Notation; Cube Root Chart; Two-Digit Root; Cube Root using Hierarchical Trinomial; Backtracking Notation; Special Cases with 0; Abstraction)	

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Recognizing and extending patterns	To help students understand how to identify and generate rule-based patterns; to help students understand how to translate rule based patterns into ordered pairs	● Golden Bead material ● Large and small number cards ● Multiplication Bead Bars ● Pattern blocks.	4.PAFR.3.2 Describe and extend a numerical pattern that follows a rule using function tables and real-world situations. 4.PAFR.3.3 Identify a rule that can describe the pattern from the data of a function table and write it as an expression. 4.ATO.5. Generate a number or shape pattern that follows a given rule and determine a term that appears later in the sequence. 4.ATO.3 Investigate the relationship between two numerical patterns. a. Generate two numerical patterns given two rules and organize in tables; b. Translate the two numerical patterns into two sets of ordered pairs; c. Graph the two sets of ordered pairs on the same coordinate plane; d. Identify the relationship between the two numerical patterns.

Measurement, Geometry, and Spatial Reasoning

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Recognizing and modeling geometric vocabulary	To give students a visual representation and provide opportunities for the child to practice using geometric vocabulary	• Geometric Box of Sticks • Geometric Cabinet	4.G.1. Draw points, lines, line segments, rays, angles (i.e., right, acute, obtuse), and parallel and perpendicular lines. Identify these in two-dimensional figures.
Classification of quadrilaterals	To give students a visual representation and provide opportunities for the child to practice classifying quadrilaterals according to various attributes; to help students see hierarchies in classification	• Geometric Box of Sticks • Geometric Cabinet	4.MGSR.3.2 Classify quadrilaterals in a hierarchy based on their shared attributes. 4.G.2. Classify quadrilaterals based on the presence or absence of parallel or perpendicular lines. 5.G.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. 5.G.4 Classify two-dimensional figures in a hierarchy based on their attributes.
Classification of triangles	To give students a visual representation and provide opportunities for the child to practice classifying right triangles	• Geometric Box of Sticks • Triangle Box • Box with 12 blue right triangles • Detective Adjective Game	4.MGSR.3.1 Classify triangles according to side length (isosceles, equilateral, scalene) and angle measure (acute, obtuse, right, equiangular). 4.G.3. Recognize right triangles as a category and identify right triangles.
Plane Geometry	To extend students' understanding of geometric equivalency	• Insets of Equivalency Drawers (Triangle Family, Parallelogram and Rhombus Family, Trapezoid Family, Polygons)	NO STANDARD LISTED
Line symmetry	To give students a visual representation of line symmetry and provide opportunities for the child to practice determining symmetry in a variety of contexts	• Constructive Triangles boxes • Geometric Box of Sticks	4.G.4. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Coordinate graphing	To help students visualize and understand the significance of representing data in the coordinate plane; to help students learn how to represent real-world and mathematical situations in the coordinate plane	• Geometric Cabinet (review) • Task cards for independent work • Integer Number Line • Elementary Negative Snake Game • Coordinate Grids	5.MGSR.3.1 Identify the origin, x-axis, and y-axis in the coordinate system. Write, plot, and label ordered pairs, including values in a function table, in the first quadrant of the coordinate plane. 5.MGSR.3.2 Represent mathematical and real-world situations by graphing, labeling, and interpreting points in the first quadrant of the coordinate plane. 6.MGSR.3.1 Plot ordered pairs in all four quadrants and identify points on a graph by writing ordered pairs. 6.MGSR.3.2 Graph a polygon on a coordinate plane given the coordinates of the vertices. 5.G.1 Define a coordinate system: a. The x- and y- axes are perpendicular number lines that intersect at 0 (the origin); b. Any point on the coordinate plane can be represented by its coordinates; c. The first number in an ordered pair is the x-coordinate and represents the horizontal distance from the origin; d. The second number in an ordered pair is the y-coordinate and represents the vertical distance from the origin. 5.G.2 Plot and interpret points in the first quadrant of the coordinate plane to represent real-world and mathematical situations. 6.GM.3 Apply the concepts of polygons and the coordinate plane to real-world and mathematical situations. a. Given coordinates of the vertices, draw a polygon in the coordinate plane. b. Find the length of an edge if the vertices have the same x-coordinates or same y-coordinates. 6.NS.6 Extend the understanding of the number line to include all rational numbers and apply this concept to the coordinate plane. a. Understand the concept of opposite numbers, including zero, and their relative locations on the number line. b. Understand that the signs of the coordinates in ordered pairs

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
			indicate their location on an axis or in a quadrant on the coordinate plane. c. Recognize when ordered pairs are reflections of each other on the coordinate plane across one axis, both axes, or the origin. d. Plot rational numbers on number lines and ordered pairs on coordinate planes. 6.NS.8 Extend knowledge of the coordinate plane to solve real-world and mathematical problems involving rational numbers. a. Plot points in all four quadrants to represent the problem. b. Find the distance between two points when ordered pairs have the same x-coordinates or same y-coordinates. c. Relate finding the distance between two points in a coordinate plane to absolute value using a number line.
Money	To help students apply basic knowledge of money values	• Teacher-made materials for independent work	4.MGSR.2.1 Calculate the value of a collection of coins and bills in real-world situations to determine whether there is enough money to make a purchase. Justify based on comparison of money amounts. 4.MDA.8 Determine the value of a collection of coins and bills greater than $1.00.
Time	To help students apply basic knowledge of solving problems with time.	• Clock with movable hands • Clock exercises • Teacher -made materials for independent work	4.MGSR.2.2 Solve real-world situations involving addition and subtraction of time intervals within 60 minutes to find elapsed time, start time, or end time.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Measurement conversion	To help students develop strategies for selecting appropriate units of measurement; to help them understand relationships among different units of measurement	• Measurement Conversion Charts • Measurement materials • Teacher-made task cards and extensions	4.MGSR.2.3 Measure length to the nearest quarter inch. 4.MGSR.2.4 Measure weight in customary units and metric units to the nearest whole unit. Limit to ounces, pounds, grams, and kilograms. 4.MGSR.2.5 Convert customary units of length, weight, and liquid volume from a larger unit to a smaller unit, given direct comparisons of the two measurements and/or the unit equivalencies within a single system of measurement. Limit to inches, feet, yards, ounces, pounds, fluid ounces, cups, pints, quarts, and gallons. 5.MGSR.2.1 Given the unit equivalencies, convert within a single system of measurement from larger units to smaller units and smaller units to larger units for length, weight, liquid volume, and time. Use these conversions in solving real-world situations. Limit units to inches, feet, yards, ounces, pounds, fluid ounces, cups, pints, quarts, gallons, seconds, minutes, hours, milli-, centi-, kilo-, and base units (grams, liters, meters). 5.MGSR.2.2 Estimate and measure lengths to the nearest eighth of an inch or nearest millimeter. 6.PAFR.2.9 Use one-step dimensional analysis to convert units within the metric or customary systems. 4.MDA.1. Convert measurements within a single system of measurement, customary (i.e., in., ft., yd., oz., lb., sec., min., hr.) or metric (i.e., cm, m, km, g, kg, mL, L) from a larger to a smaller unit. 5.MDA.1 Convert measurements within a single system of measurement: customary (i.e., in., ft., yd., oz., lb., sec., min., hr.) or metric (i.e., mm, cm, m, km, g, kg, mL, L) from a larger to a smaller unit and a smaller to a larger unit.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Developing facility with area, perimeter, volume, circumference, and surface area; applying understanding to solve multi-step word problems	To help students understand and visualize the concept of volume; to help students practice differentiating among and solving area, perimeter, volume, and circumference word problems	• Yellow Area Material (Rectangle, Parallelogram, Triangle, Square) • Equivalent Figure Material • Tangrams • Geoboards • Constructive Triangles • Geometry Cabinet • Yellow Volume Material • Volume Boxes (250 and 1000 cubes) • Blue Geometric Shapes (solid shapes; hollow square pyramid and cone) • Solids of Rotation • Cubing material • Teacher-made task cards and extensions • Circumference/area work with circles (Redefining a Circle, Circumference, Area of a Circle) • Work with Polyhedrons • Concept and Surface Area (Sensorial Introduction; Lateral and Total Surface Area with Square and Triangular Prisms; Cylinder; Square Pyramid; Cone)	4.MGSR.1.1 Apply perimeter formulas for rectangles to solve real-world situations including finding the perimeter, given the side lengths, and finding an unknown side length. 4.MGSR.1.2 Apply area formulas for rectangles to solve real- world situations. Use square units to label area measurements. 5.MGSR.1.1 Solve problems involving area and perimeter of composite figures by decomposing with rectangles. 5.MGSR.1.2 Estimate and measure the volume of a right rectangular prism with whole-number side lengths by filling it with unit cubes. 6.MGSR.1.1 Find the area of a triangle, square, rectangle, parallelogram, and trapezoid. 6.MGSR.1.2 Create nets to represent three-dimensional shapes. 6.MGSR.1.3 Calculate the surface area of rectangular prisms, right triangular prisms, rectangular pyramids, and right triangular pyramids using two-dimensional nets. 6.MGSR.1.4 Find the area of composite figures by decomposing them into triangles and rectangles to solve mathematical and real-world situations. 6.MGSR.1.5 Calculate the volume of a right rectangular prism using the formula (V = Bh) in mathematical and real-world situations. 4. MDA.3 Apply the area and perimeter formulas for rectangles. 5. MDA.3 Understand the concept of volume measurement. a. Recognize volume as an attribute of right rectangular prisms; b. Relate volume measurement to the operations of multiplication and addition by packing right rectangular prisms and then counting the layers of standard unit cubes; c. Determine the volume of right rectangular prisms using the formula derived from packing right rectangular prisms and counting the layers of standard unit cubes.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
			5.MDA.4 Differentiate among perimeter, area and volume and identify which application is appropriate for a given situation. 6.GM.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. 6.GM.2 Use visual models (e.g., model by packing) to discover that the formulas for the volume of a right rectangular prism ($VV=lllh$,$VV=BBh$) are the same for whole or fractional edge lengths. Apply these formulas to solve real-world and mathematical problems. 6.GM.4 Unfold three-dimensional figures into two-dimensional rectangles and triangles (nets) to find the surface area and to solve real-world and mathematical problems.
Angle measurement	To help students understand and apply basic knowledge of angle measurement	• Montessori Protractor • Centisimal Frame	6.MGSR.2.1 Determine if two angles are complementary or supplementary. 6.MGSR.2.2 Determine the measure of angles using a protractor. 4.MDA.5 Understand the relationship of an angle measurement to a circle. 4.MDA.6 Measure and draw angles in whole number degrees using a protractor.
Line plots with fractions	To help students understand how to represent data on a line plot and use it to solve real-world problems	• Teacher-made materials to help students create and analyze line plots	4. MDA.4. Create a line plot to display a data set (i.e., generated by measuring length to the nearest quarter inch and eighth inch) and interpret the line plot. 5. MDA.2 Create a line plot consisting of unit fractions and use operations on fractions to solve problems related to the line plot.

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
Measurement word problems	To help students develop and apply strategies for solving real-world problems using appropriate units of measurement	• Teacher-made task cards for independent work	4.MDA.2. Solve real-world problems involving distance/length, intervals of time within 12 hours, liquid volume, mass, and money using the four operations. 4.MDA.7 Solve addition and subtraction problems to find unknown angles in real-world and mathematical problems.
Creating, describing, and evaluating data sets	To help students understand a variety of data sets and practice creating, describing, and evaluating data sets	• Teacher made task cards • Student-initiated problem solving with real world data sets	4.DPSR.1.1 Collect and organize numerical and categorical data based on observations, investigations, surveys, and experiments using tables, scaled bar graphs, or dot plots. Use titles and labels. Scales to include whole numbers, halves, and fourths. 4.DPSR.1.2 Solve one-step, real-world situations using whole number and fractional data represented in tables, scaled picture graphs, scaled bar graphs, or dot plots. Limit to like denominators of 2, 3, 4, 5, 6, 8, and 10. 5.DPSR.1.1 Describe data by determining the range and mode, including whole numbers, fractional data, and decimal data. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, and 10, and limit decimals to decimals through the hundredths place. 5.DPSR.1.2 Solve two-step, real-world situations using whole number and fractional data represented in tables, line graphs, scaled bar graphs, or dot plots. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100. 5.DPSR.1.3 Analyze categorical and numerical data in graphical displays to make predictions or draw conclusions. Limit displays to tables, bar graphs, dot plots, line graphs, and circle graphs with scales of whole numbers, halves, fourths, and eighths. 6.DPSR.1.1 Identify the sample size for a numerical set of data in mathematical and real-world situations. 6.DPSR.1.2 Create box plots to represent numerical data sets in

Concept	Objectives Montessori Method (Aims)	Montessori Materials	SCCCR Standards
			mathematical and real-world situations. 6.DPSR.1.3 Use the shape of the graph to determine whether median or mode best describes the data set. 6.DPSR.1.4 Calculate and interpret the median, mode, range, interquartile range in mathematical and real-world situations. 6.DS.1 Differentiate between statistical and non-statistical questions. 6.DS.2 Use center (mean, median, mode), spread (range, interquartile range, mean absolute value), and shape (symmetrical, skewed left, skewed right) to describe the distribution of a set of data collected to answer a statistical question. 6.DS.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. 6.DS.4 Select and create an appropriate display for numerical data, including dot plots, histograms, and box plots. 6.DS.5 Describe numerical data sets in relation to their real-world context. a. State the sample size. b. Describe the qualitative aspects of the data (e.g., how it was measured, units of measurement). c. Give measures of center (median, mean). d. Find measures of variability (interquartile range, mean absolute deviation) using a number line. e. Describe the overall pattern (shape) of the distribution. f. Justify the choices for measure of center and measure of variability based on the shape of the distribution. g. Describe the impact that inserting or deleting a data point has on the measures of center (median, mean) for a data set.