Think Through Math

BUILT FOR COLORADO

2015 – 2016

Colorado Learning Pathways

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Unit	Lesson & Standards Addressed
Number and Operations in Base Ten	Visualizing Whole Numbers Introductory Lesson (no pre-quiz) Visualizing Place Value Introductory Lesson (no pre-quiz)
Operations and Algebraic Thinking	Visualizing Addition Introductory Lesson (no pre-quiz) Visualizing Subtraction Introductory Lesson (no pre-quiz)
Number and Operations in Base Ten	Reasoning About Place Value and Rounding 3.1.1.a.i Use place value understanding to round whole numbers to the nearest 10 or 100. Rounding to the Nearest Ten and Hundred 3.1.1.a.i Use place value understanding to round whole numbers to the nearest 10 or 100.
Operations and Algebraic Thinking	Estimating Sums and Differences - Application 3.1.3.d.iii Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
Number and Operations in Base Ten	Reasoning About Addition and Subtraction Within 1,000 3.1.1.a.ii 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.
Operations and Algebraic Thinking	Concept of Multiplication - Grouping 3.1.3.a.i Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. Concept of Multiplication - Word Problems 3.1.3.a.i Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. Concept of Multiplication - Arrays 3.1.3.a.i Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. Properties of Addition and Multiplication 3.1.3.b.i Apply properties of operations as strategies to multiply and divide. Applying Properties of Addition and Multiplication to Area Models 3.1.3.b.i Apply properties of operations as strategies to multiply and divide. Concept of Division 3.1.3.a.ii Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. Interpreting Division Problems 3.1.3.a.ii Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. Constructing Division Problems 3.1.3.a.ii Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

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Unit	Lesson & Standards Addressed
Operations and Algebraic Thinking (continued)	Relationship Between Multiplication and Division 3.1.3.b.i Apply properties of operations as strategies to multiply and divide. Multiplication and Division Fact Families 3.1.3.b.i Apply properties of operations as strategies to multiply and divide. 3.1.3.b.ii Interpret division as an unknown-factor problem. 3.1.3.c.i Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations. 3.1.3.c.ii Recall from memory all products of two one-digit numbers. Solving Multiplication and Division Equations 3.1.3.a.iv Determine the unknown whole number in a multiplication or division equation relating three whole numbers. 3.1.3.b.ii Interpret division as an unknown-factor problem. Division as an Unknown-Factor Problem 3.1.3.a.iv Determine the unknown whole number in a multiplication or division equation relating three whole numbers. 3.1.3.b.ii Interpret division as an unknown-factor problem. Multiplication and Division Word Problems - Visual Models 3.1.3.a.iii Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. Multiplication and Division Word Problems - Equations 3.1.3.a.iii Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. Multiplication and Division Word Problems - Solutions 3.1.3.a.iii Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
Number and Operations in Base Ten	Multiplying by Multiples of Ten 3.1.1.a.iii Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.
Operations and Algebraic Thinking	Solving Two-Step Word Problems 3.1.3.d.i Solve two-step word problems using the four operations. 3.1.3.d.ii Represent two-step word problems using equations with a letter standing for the unknown quantity. 3.1.3.d.iii Assess the reasonableness of answers using mental computation and estimation strategies including rounding. Modeling and Solving Two-Step Word Problems 3.1.3.d.i Solve two-step word problems using the four operations. 3.1.3.d.ii Represent two-step word problems using equations with a letter standing for the unknown quantity. 3.1.3.d.iii Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
Number and Operations - Fractions	Understanding Fractions - Equal Areas 3.1.2.a.i Describe a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; describe a fraction a/b as the quantity formed by a parts of size 1/b. Understanding Fractions - Notation 3.4.1.a.ii Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. Unit Fractions on the Number Line 3.1.2.a.ii Describe a fraction as a number on the number line; represent fractions on a number line diagram. Represent a fraction 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 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.

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Unit	Lesson & Standards Addressed
Number and Operations - Fractions (continued)	Fractions on the Number Line 3.1.2.a.ii Describe a fraction as a number on the number line; represent fractions on a number line diagram. Represent a fraction 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 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line. Modeling Equivalent Fractions with Number Lines 3.1.2.a.iii.1 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. Identify two fractions as equivalent (equal) if they are the same size, or the same point on a number line. Visual Models of Equivalent Fractions 3.1.2.a.iii.2 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. Identify and generate simple equivalent fractions. Explain why the fractions are equivalent. Whole Numbers as Fractions 3.1.2.a.iii.3 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Whole Numbers as Fractions on the Number Line 3.1.2.a.iii.3 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Comparing Fractions with the Same Numerator or Denominator 3.1.2.a.iii.4 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. Compare two fractions with the same numerator or the same denominator by reasoning about their size. 3.1.2.a.iii.6 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. Recognizing Valid Fraction Comparisons I 3.1.2.a.iii.4 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. Compare two fractions with the same numerator or the same denominator by reasoning about their size. 3.1.2.a.iii.5 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. Explain why comparisons are valid only when the two fractions refer to the same whole. 3.1.2.a.iii.6 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.
Measurement and Data	Money Sense 2.4.2.c.ii Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. Adding and Subtracting Time 3.4.3.a.i Tell and write time to the nearest minute. 3.4.3.a.ii Measure time intervals in minutes. 3.4.3.a.iii Solve word problems involving addition and subtraction of time intervals in minutes using a number line diagram.

Unit	*Lesson & Standards Addressed*
Measurement and Data (continued)	Unit Squares 3.4.2.a.i Recognize area as an attribute of plane figures and understand concepts of area measurement. 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. 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.
	Concept of Area 3.4.2.a.i Recognize area as an attribute of plane figures and understand concepts of area measurement. 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. 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.
	Area of Rectangles 3.4.2.a.ii Find area of rectangles with whole number side lengths using a variety of methods. 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. 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. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). 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. 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.
	Recognizing Area as Additive 3.4.2.a.ii Find area of rectangles with whole number side lengths using a variety of methods. 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. 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. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). 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. 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.
	Area of Basic Composite Figures 3.4.2.a.ii Find area of rectangles with whole number side lengths using a variety of methods. 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. 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. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). 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. 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.
	Perimeter 3.4.2.c Solve real world and mathematical problems involving perimeters of polygons. 3.4.2.c.i Find the perimeter given the side lengths. 3.4.2.c.ii Find an unknown side length given the perimeter. 3.4.2.c.iii Find rectangles with the same perimeter and different areas or with the same area and different perimeters.
	Capacity or Weight 3.4.3.a.iv Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). 3.4.3.a.v Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

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Unit	Lesson & Standards Addressed
Geometry	Classifying Quadrilaterals I 3.4.1.a.i Explain that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). 3.4.1.a.i.1 Explain that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Identify rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.
Measurement and Data	Introduction to Data Displays 3.3.1.a.i Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. 3.3.1.a.ii Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.
Operations and Algebraic Thinking	Additive and Multiplicative Patterns 3.1.3.d.iv Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations.

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Unit	Lesson & Standards Addressed
Number and Operations in Base Ten	Visualizing Place Value Relationships Introductory Lesson (no pre-quiz) Visualizing Rounding Introductory Lesson (no pre-quiz)
Operations and Algebraic Thinking	Visualizing Addition and Subtraction Introductory Lesson (no pre-quiz) Visualizing Multiplication and Division Introductory Lesson (no pre-quiz)
Number and Operations in Base Ten	Understanding Place Value Relationships 4.1.1.a.i Explain that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. Using Place Value Concepts to Compare Whole Numbers 4.1.1.a.ii Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. 4.1.1.a.iii Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. Rounding Whole Numbers 4.1.1.a.iv Use place value understanding to round multi-digit whole numbers to any place. Using Rounding in Problem Solving 4.1.1.a.iv Use place value understanding to round multi-digit whole numbers to any place. Adding Whole Numbers 4.1.3.a.i Fluently add and subtract multi-digit whole numbers using the standard algorithm. Adding and Subtracting with the Standard Algorithm 4.1.3.a.i Fluently add and subtract multi-digit whole numbers using the standard algorithm. Multiplying Whole Numbers 4.1.3.a.ii 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. Dividing Whole Numbers - One-Digit Divisors 4.1.3.a.iii 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. 4.1.3.a.iv Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
Operations and Algebraic Thinking	Multiplication as a Comparison - Word Problems 4.1.3.b.i Interpret a multiplication equation as a comparison. 4.1.3.b.iii Multiply or divide to solve word problems involving multiplicative comparison. Multiplication as a Comparison - Equations 4.1.3.b.ii Represent verbal statements of multiplicative comparisons as multiplication equations. Interpreting Remainders 4.1.3.b.iv Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 4.1.3.b.v Represent multistep word problems with equations using a variable to represent the unknown quantity. 4.1.3.b.vi Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

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Unit	Lesson & Standards Addressed
Operations and Algebraic Thinking (continued)	Relating Factors and Multiples I 4.2.1.b.i Find all factor pairs for a whole number in the range 1-100. 4.2.1.b.ii Recognize that a whole number is a multiple of each of its factors. 4.2.1.b.iii Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Factors 4.2.1.b.i Find all factor pairs for a whole number in the range 1-100. 4.2.1.b.iv Determine whether a given whole number in the range 1-100 is prime or composite. Relating Factors and Multiples II 4.2.1.b.i Find all factor pairs for a whole number in the range 1-100. 4.2.1.b.ii Recognize that a whole number is a multiple of each of its factors. 4.2.1.b.iii Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. 4.2.1.b.iv Determine whether a given whole number in the range 1-100 is prime or composite.
Number and Operations - Fractions	Modeling Equivalent Fractions 4.1.2.a.ii Use the principle of fraction equivalence to recognize and generate equivalent fractions. Generating Equivalent Fractions 4.1.2.a.ii Use the principle of fraction equivalence to recognize and generate equivalent fractions. Reducing Fractions 4.1.2.a.ii Use the principle of fraction equivalence to recognize and generate equivalent fractions. Comparing Fractions with Different Numerators and Different Denominators 4.1.2.a.iii Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. Recognizing Valid Fraction Comparisons II 4.1.2.a.iii Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. Decomposing Fractions and Mixed Numbers 4.1.2.b.i.1 Compose and decompose fractions as sums and differences of fractions with the same denominator in more than one way and justify with visual models. Writing Fractions as Mixed Numbers and Mixed Numbers as Fractions 4.1.2.b.i.1 Compose and decompose fractions as sums and differences of fractions with the same denominator in more than one way and justify with visual models. Understanding Fractions - Relationship Between Numerator and Denominator 4.1.2.a.ii Use the principle of fraction equivalence to recognize and generate equivalent fractions. Adding and Subtracting Fractions with Like Denominators 4.1.2.b.i Apply previous understandings of addition and subtraction to add and subtract fractions. Understand a fraction a/b with a > 1 as a sum of fractions 1/b. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8. Adding and Subtracting Fractions with Like Denominators in Real-World Situations 4.1.2.b.i Apply previous understandings of addition and subtraction to add and subtract fractions. Understand a fraction a/b with a > 1 as a sum of fractions 1/b. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.

Unit	Lesson & Standards Addressed
Number and Operations - Fractions (continued)	Adding and Subtracting Mixed Numbers with Like Denominators - Conceptual Strategies 4.1.2.b.i.2 Apply previous understandings of addition and subtraction to add and subtract fractions. Understand a fraction a/b with a > 1 as a sum of fractions 1/b. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8. 2. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. Adding and Subtracting Mixed Numbers with Like Denominators 4.1.2.b.i.2 Apply previous understandings of addition and subtraction to add and subtract fractions. Understand a fraction a/b with a > 1 as a sum of fractions 1/b. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
Number and Operations in Base Ten	Comparing Decimal Fractions 4.1.1.b.ii Use decimal notation for fractions with denominators 10 or 100. Comparing and Ordering Decimal Fractions 4.1.1.b.ii Use decimal notation for fractions with denominators 10 or 100. Decimal Notation I 4.1.1.b.ii Use decimal notation for fractions with denominators 10 or 100. Decimal Notation II 4.1.1.b.ii Use decimal notation for fractions with denominators 10 or 100. Decimals to Hundredths 4.1.1.b.iii 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. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model. Introduction to Comparing Decimals to Hundredths 4.1.1.b.iii 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. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model. Comparing Decimals to Hundredths 4.1.1.b.iii 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. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model. Recognizing Valid Decimal Comparisons 4.1.1.b.iii 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. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model. Fraction and Decimal Equivalents 4.1.1.b.ii Use decimal notation for fractions with denominators 10 or 100. Comparing Fractions and Decimals 4.1.1.b.ii Use decimal notation for fractions with denominators 10 or 100.

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Unit	Lesson & Standards Addressed
Number and Operations - Fractions	Word Problems with Fractions and Mixed Numbers - Visual Models 4.1.2.b.i.3 Apply previous understandings of addition and subtraction to add and subtract fractions. Understand a fraction a/b with a > 1 as a sum of fractions 1/b. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. Word Problems with Fractions and Mixed Numbers - Estimation 4.1.2.b.i.3 Apply previous understandings of addition and subtraction to add and subtract fractions. Understand a fraction a/b with a > 1 as a sum of fractions 1/b. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. Multiplying Unit Fractions by Whole Numbers 4.1.2.b.ii.1 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. Express a fraction a/b as a multiple of 1/b. Multiplying Fractions by Whole Numbers 4.1.2.b.ii.2 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. Use a visual fraction model to express a/b as a multiple of 1/b, and apply to multiplication of whole number by a fraction. Solving Word Problems with Multiplication of Fractions by Whole Numbers 4.1.2.b.ii.3 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. Understanding Fractions with Denominators of 10 and 100 4.1.1.b.i 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. Adding Fractions with Denominators of 10 or 100 4.1.1.b.i 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.
Measurement and Data	Area and Perimeter of Rectangles 4.4.1.a.v Apply the area and perimeter formulas for rectangles in real world and mathematical problems. Angles 4.4.1.b.i Describe angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles. An angle that turns through n one-degree angles is said to have an angle measure of n degrees. 4.4.1.b.ii Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. 4.4.1.b.iii Demonstrate angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. 4.4.1.b.iv Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

Grade 4 Colorado Learning Pathway

Unit	*Lesson & Standards Addressed*
Geometry	Classifying Triangles 4.4.2.a Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. 4.4.2.b Identify points, line segments, angles, and perpendicular and parallel lines in two-dimensional figures. 4.4.2.c Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles. Classifying Quadrilaterals II 4.4.2.a Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. 4.4.2.b Identify points, line segments, angles, and perpendicular and parallel lines in two-dimensional figures. 4.4.2.c Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles. Symmetry 4.4.2.d 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.
Measurement and Data	Units of Measure - Customary 4.4.1.a.i Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. 4.4.1.a.ii Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. Units of Measure - Metric 4.4.1.a.i Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. 4.4.1.a.ii Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.
Operations and Algebraic Thinking	Generating and Describing Number Patterns 4.2.1.a Generate and analyze patterns and identify apparent features of the pattern that were not explicit in the rule itself.

Grade 5 Colorado Learning Pathway

Unit	Lesson & Standards Addressed
Number and Operations in Base Ten	Place Value Relationships Within Whole Numbers and Decimals 5.1.1.a Explain that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. Multiplying Whole Numbers - Standard Algorithm 5.1.2.a Fluently multiply multi-digit whole numbers using the standard algorithm. Dividing Whole Numbers - Two-Digit Divisors 5.1.2.b Find whole-number quotients of whole numbers. 5.1.2.b.i Use strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. 5.1.2.b.ii Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. Operations with Whole Numbers - Mixed Practice 5.1.2 Formulate, represent, and use algorithms with multi-digit whole numbers and decimals with flexibility, accuracy, and efficiency.
Number and Operations - Fractions	Understanding Fractions as Division 5.1.4.a Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). 5.1.4.b Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. Adding Fractions 5.1.3.a.ii 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. Adding Fractions - Estimation Strategies 5.1.3.a.iii Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. 5.1.3.a.i Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. Subtracting Fractions 5.1.3.a.ii 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. Subtracting Fractions - Estimation Strategies 5.1.3.a.iii Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. 5.1.3.a.i Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. Multiplying Unit Fractions by Fractions and Understanding Multiplication as Scaling 5.1.4 The concepts of multiplication and division can be applied to multiply and divide fractions. 5.1.4.e.i Interpret multiplication as scaling (resizing), by: Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. Explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number. 5.1.4.e.ii Interpret multiplication as scaling (resizing), by: Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number. Apply the principle of fraction equivalence a/b = (n×a)/(n×b) to the effect of multiplying a/b by 1.

Unit	*Lesson & Standards Addressed*
Number and Operations - Fractions (continued)	Multiplying Fractions by Fractions 5.1.4.c The concepts of multiplication and division can be applied to multiply and divide fractions. Interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. In general, (a/b) × (c/d) = ac/bd. 5.1.4.d The concepts of multiplication and division can be applied to multiply and divide fractions. 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. 5.1.4.d.i Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. Adding and Subtracting Fractions 5.1.3.a.ii 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. 5.1.3.a.iii Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. 5.1.3.a.i Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. Adding and Subtracting Fractions - Multistep Word Problems 5.1.3.a.ii 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. 5.1.3.a.iii Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. 5.1.3.a.i Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. Multiplying Fractions by Whole Numbers to Solve Multistep Problems 5.1.4 The concepts of multiplication and division can be applied to multiply and divide fractions. 5.1.4.f Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. Dividing Unit Fractions by Whole Numbers 5.1.4.g The concepts of multiplication and division can be applied to multiply and divide fractions. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. 5.1.4.i The concepts of multiplication and division can be applied to multiply and divide fractions. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. Dividing Whole Numbers by Unit Fractions 5.1.4.h The concepts of multiplication and division can be applied to multiply and divide fractions. Interpret division of a whole number by a unit fraction, and compute such quotients. 5.1.4.i The concepts of multiplication and division can be applied to multiply and divide fractions. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem.

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Unit	Lesson & Standards Addressed
Number and Operations in Base Ten	Decimals to Thousandths 5.1.1.b.i Read, write, and compare decimals to thousandths. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000). Comparing Decimals to Thousandths 5.1.1.b.ii Read, write, and compare decimals to thousandths. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. Fraction and Decimal Equivalents 5.1.1.b.i Read, write, and compare decimals to thousandths. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000). Comparing Fractions and Decimals 5.1.1.b.i Read, write, and compare decimals to thousandths. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000). Rounding Decimals to the Nearest Tenth and Hundredth 5.1.1.c Use place value understanding to round decimals to any place. Reasoning About Rounding Decimals 5.1.1.c Use place value understanding to round decimals to any place. Adding and Subtracting Decimals 5.1.2.c Add, subtract, multiply, and divide decimals to hundredths. 5.1.2.c.i Use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. 5.1.2.c.ii Relate strategies to a written method and explain the reasoning used. Adding and Subtracting Decimals in Real-World Situations 5.1.2.c Add, subtract, multiply, and divide decimals to hundredths. 5.1.2.c.i Use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. 5.1.2.c.ii Relate strategies to a written method and explain the reasoning used. Multiplying by Powers of Ten 5.1.1.a.i Explain patterns in the number of zeros of the product when multiplying a number by powers of 10. 5.1.1.a.ii Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. 5.1.1.a.iii Use whole-number exponents to denote powers of 10. Multiplying and Dividing by Powers of Ten 5.1.1.a.i Explain patterns in the number of zeros of the product when multiplying a number by powers of 10. 5.1.1.a.ii Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. 5.1.1.a.iii Use whole-number exponents to denote powers of 10. Multiplying Decimals to Hundredths 5.1.2.c Add, subtract, multiply, and divide decimals to hundredths. 5.1.2.c.i Use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. 5.1.2.c.ii Relate strategies to a written method and explain the reasoning used. Dividing Decimals to Hundredths 5.1.2.c Add, subtract, multiply, and divide decimals to hundredths. 5.1.2.c.i Use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. 5.1.2.c.ii Relate strategies to a written method and explain the reasoning used.

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Unit	Lesson & Standards Addressed
Number and Operations in Base Ten (continued)	Using Reasoning and Estimation to Calculate with Decimals 5.1.2.c Add, subtract, multiply, and divide decimals to hundredths. 5.1.2.c.i Use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. 5.1.2.c.ii Relate strategies to a written method and explain the reasoning used. Calculating with Decimals 5.1.2.c Add, subtract, multiply, and divide decimals to hundredths. 5.1.2.c.i Use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. 5.1.2.c.ii Relate strategies to a written method and explain the reasoning used.
Expressions and Equations	Evaluating Simple Expressions 5.1.2.d.i Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
Operations and Algebraic Thinking	Writing Simple Expressions 5.1.2.d.ii Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. Writing and Interpreting Simple Expressions 5.1.2.d.ii Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.
Geometry	Introduction to the Coordinate Plane 5.4.2.a Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). Representing Real-World Quantities in the First Quadrant 5.4.2.b Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. Introduction to Scatter Plots 5.4.2.a Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). 5.4.2.b Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

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Unit	*Lesson & Standards Addressed*
Measurement and Data	Volume of Rectangular Prisms I 5.4.1.a.i Model and justify the formula for volume of rectangular prisms. Model the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes. 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. 5.4.1.b.i Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. Volume of Rectangular Prisms II 5.4.1.a.ii Model and justify the formula for volume of rectangular prisms. 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. 5.4.1.a.iii Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. 5.4.1.b.ii Find volume of rectangular prisms using a variety of methods and use these techniques to solve real world and mathematical problems. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths. 5.4.1.b.iii Find volume of rectangular prisms using a variety of methods and use these techniques to solve real world and mathematical problems. Use the additive nature of volume to find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts.
Geometry	Classifying Quadrilaterals II 5.4.2.c.i Explain that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. 5.4.2.c.ii Classify two-dimensional figures in a hierarchy based on properties. Classifying 2-Dimensional Figures 5.4.2.c.i Explain that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. 5.4.2.c.ii Classify two-dimensional figures in a hierarchy based on properties.
Measurement and Data	Line Plots 5.3.1.a.i Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). 5.3.1.a.ii Use operations on fractions for this grade to solve problems involving information presented in line plots.

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Unit	Lesson & Standards Addressed
Number and Operations in Base Ten	Dividing Whole Numbers - Standard Algorithm 6.1.2.a Fluently divide multi-digit numbers using the standard algorithm. Adding and Subtracting Decimals 6.1.2.b Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. Adding and Subtracting Decimals in Real-World Situations 6.1.2.b Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. Using Reasoning and Estimation to Calculate with Decimals 6.1.2.b Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. Calculating with Decimals 6.1.2.b Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
The Number System	Greatest Common Factor 6.1.2.c Find the greatest common factor of two whole numbers less than or equal to 100. 6.1.2.d Find the least common multiple of two whole numbers less than or equal to 12. 6.1.2.e 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. Greatest Common Factor - Applications 6.1.2.c Find the greatest common factor of two whole numbers less than or equal to 100. 6.1.2.d Find the least common multiple of two whole numbers less than or equal to 12. 6.1.2.e 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. Least Common Multiple 6.1.2.c Find the greatest common factor of two whole numbers less than or equal to 100. 6.1.2.d Find the least common multiple of two whole numbers less than or equal to 12. 6.1.2.e 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. Using the Relationship Between Multiplication and Division to Divide Fractions 6.1.2.f Interpret and model quotients of fractions through the creation of story contexts. 6.1.2.g Compute quotients of fractions. In general, (a/b) ÷ (c/d) = ad/bc). 6.1.2.h Solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. Dividing Fractions by Fractions 6.1.2.f Interpret and model quotients of fractions through the creation of story contexts. 6.1.2.g Compute quotients of fractions. In general, (a/b) ÷ (c/d) = ad/bc). 6.1.2.h Solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. Using Division of Fractions to Represent and Solve Problems 6.1.2.f Interpret and model quotients of fractions through the creation of story contexts. 6.1.2.g Compute quotients of fractions. In general, (a/b) ÷ (c/d) = ad/bc). 6.1.2.h Solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. Operations with Fractions - Mixed Practice 6.1.2.f Interpret and model quotients of fractions through the creation of story contexts. 6.1.2.g Compute quotients of fractions. In general, (a/b) ÷ (c/d) = ad/bc). 6.1.2.h Solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

Unit	*Lesson & Standards Addressed*
Ratios and Proportional Relationships	Identifying Ratios 6.1.1.a Apply the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. Ratios 6.1.1.a Apply the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. 6.1.1.c 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 diagrams, or equations. Concept of Ratios and Rates 6.1.1.a Apply the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. 6.1.1.b Apply the concept of a unit rate a/b associated with a ratio a:b with b is not equal to 0, and use rate language in the context of a ratio relationship. Using Ratios to Solve Problems 6.1.1.c 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 diagrams, or equations. 6.1.1.c.i Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. Identifying Unit Rates 6.1.1.a Apply the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. 6.1.1.b Apply the concept of a unit rate a/b associated with a ratio a:b with b is not equal to 0, and use rate language in the context of a ratio relationship. Solving Problems with Unit Rates 6.1.1.a Apply the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. 6.1.1.b Apply the concept of a unit rate a/b associated with a ratio a:b with b is not equal to 0, and use rate language in the context of a ratio relationship. 6.1.1.c 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 diagrams, or equations. 6.1.1.c.iii Solve unit rate problems including those involving unit pricing and constant speed. Converting Units of Measure I 6.1.1.c 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 diagrams, or equations. 6.1.1.c.viii Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. Converting Units of Measure II 6.1.1.c 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 diagrams, or equations. 6.1.1.c.viii Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. Distance, Rate, and Time 6.1.1.c 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 diagrams, or equations. 6.1.1.c.iii Solve unit rate problems including those involving unit pricing and constant speed. Percent Concepts 6.1.1.c 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 diagrams, or equations. 6.1.1.c.iv Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity). 6.1.1.c.v solve problems involving finding the whole, given a part and the percent.

Unit	*Lesson & Standards Addressed*
Ratios and Proportional Relationships (continued)	Reasoning with Percents 6.1.1.c 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 diagrams, or equations. 6.1.1.c.iv Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity). 6.1.1.c.v solve problems involving finding the whole, given a part and the percent. Calculations with Percent 6.1.1.c 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 diagrams, or equations. 6.1.1.c.iv Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity). 6.1.1.c.v solve problems involving finding the whole, given a part and the percent.
The Number System	Integer Concepts 6.1.3.a Explain why 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). 6.1.3.a.i Use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. 6.1.3.b Use number line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane. 6.1.3.b.i Describe a rational number as a point on the number line. 6.1.3.b.v Find and position integers and other rational numbers on a horizontal or vertical number line diagram. 6.1.3.b.vi Find and position pairs of integers and other rational numbers on a coordinate plane. Integer Concepts with a Number Line 6.1.3.b Use number line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane. 6.1.3.b.i Describe a rational number as a point on the number line. 61.3.b.ii Use opposite signs of numbers to indicate locations on opposite sides of 0 on the number line. 6.1.3.b.iii Identify that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite. 6.1.3.b.v Find and position integers and other rational numbers on a horizontal or vertical number line diagram. 6.1.3.b.vi Find and position pairs of integers and other rational numbers on a coordinate plane. Absolute Value I 6.1.3.c Order and find absolute value of rational numbers. 6.1.3.c.iii Define the absolute value of a rational number as its distance from 0 on the number line and interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. Absolute Value II 6.1.3.c Order and find absolute value of rational numbers. 6.1.3.c.iv Distinguish comparisons of absolute value from statements about order. Comparing Rational Numbers I 6.1.3.b Use number line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane. 6.1.3.b.i Describe a rational number as a point on the number line. 6.1.3.b.v Find and position integers and other rational numbers on a horizontal or vertical number line diagram. 6.1.3.b.vi Find and position pairs of integers and other rational numbers on a coordinate plane. Comparing Rational Numbers II 6.1.3.c Order and find absolute value of rational numbers. 6.1.3.c.i Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.

Unit	*Lesson & Standards Addressed*
The Number System (continued)	Classifying and Ordering Real Numbers 6.1.3.c Order and find absolute value of rational numbers. 6.1.3.c.i Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. 6.1.3.c.ii Write, interpret, and explain statements of order for rational numbers in real-world contexts.
Expressions and Equations	Evaluating Simple Expressions 6.2.1.b Write, read, and evaluate expressions in which letters stand for numbers. 6.2.1.b.iii Evaluate expressions at specific values of their variables including expressions that arise from formulas used in real-world problems. 6.2.1.b.iv 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). Reasoning About One-Step Equations 6.2.2.a Describe solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? 6.2.2.b Use substitution to determine whether a given number in a specified set makes an equation or inequality true. Writing and Solving One-Step Equations 6.2.2.d Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers. Evaluating Expressions with Two Operations 6.2.1.b Write, read, and evaluate expressions in which letters stand for numbers. 6.2.1.b.iii Evaluate expressions at specific values of their variables including expressions that arise from formulas used in real-world problems. 6.2.1.b.iv 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). Evaluating Expressions with Real Numbers 6.2.1.b Write, read, and evaluate expressions in which letters stand for numbers. 6.2.1.b.ii 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. Identifying and Generating Equivalent Expressions 6.2.1.c Apply the properties of operations to generate equivalent expressions. 6.2.1.d Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). Evaluating Expressions with the Distributive Property 6.2.1.c Apply the properties of operations to generate equivalent expressions. Using the Distributive Property to Represent Real-World Situations 6.2.1.c Apply the properties of operations to generate equivalent expressions. Independent and Dependent Quantities 6.2.2.g.i Use variables to represent two quantities in a real-world problem that change in relationship to one another. 6.2.2.g.ii 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. 6.2.2.g.iii Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

Unit	*Lesson & Standards Addressed*
Geometry	Area of Parallelograms 6.4.1.a.i Develop and apply formulas and procedures for area of plane figures. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes. 6.4.1.a.ii Develop and apply formulas and procedures for area of plane figures. Apply these techniques in the context of solving real-world and mathematical problems. Area of Triangles 6.4.1.a.i Develop and apply formulas and procedures for area of plane figures. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes. 6.4.1.a.ii Develop and apply formulas and procedures for area of plane figures. Apply these techniques in the context of solving real-world and mathematical problems. Area of Trapezoids and Composite Figures 6.4.1.a.i Develop and apply formulas and procedures for area of plane figures. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes. 6.4.1.a.ii Develop and apply formulas and procedures for area of plane figures. Apply these techniques in the context of solving real-world and mathematical problems. Surface Area and Volume of Rectangular Prisms 6.4.1.b.i Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths. 6.4.1.b.ii Show that the volume is the same as would be found by multiplying the edge lengths of the prism. 6.4.1.b.iii Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. 6.4.1.d.i Represent three-dimensional figures using nets made up of rectangles and triangles. 6.4.1.d.ii Use the nets to find the surface area of figures. 6.4.1.d.iii Apply techniques for finding surface area in the context of solving real-world and mathematical problems. Surface Area of Pyramids 6.4.1.d.i Represent three-dimensional figures using nets made up of rectangles and triangles. 6.4.1.d.ii Use the nets to find the surface area of figures. 6.4.1.d.iii Apply techniques for finding surface area in the context of solving real-world and mathematical problems.

Grade 6 Colorado Learning Pathway

Unit	Lesson & Standards Addressed
The Number System	Integers in the Coordinate Plane I 6.1.3.b Use number line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane. 6.1.3.b.iv Explain when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. Integers in the Coordinate Plane II 6.1.3.b Use number line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane. 6.1.3.b.iv Explain when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. Rational Numbers in the Coordinate Plane I 6.1.3.b Use number line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane. 6.1.3.b.v Find and position integers and other rational numbers on a horizontal or vertical number line diagram. 6.1.3.b.vi Find and position pairs of integers and other rational numbers on a coordinate plane. Rational Numbers in the Coordinate Plane II 6.1.1.c 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 diagrams, or equations. 6.1.1.c.i Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. 6.1.3.b Use number line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane. 6.1.3.b.iv Explain 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.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.
Geometry	Distance on the Coordinate Plane I 6.4.1.c Draw polygons in the coordinate plan to solve real-world and mathematical problems. 6.4.1.c.i Draw polygons in the coordinate plane given coordinates for the vertices. 6.4.1.c.ii Use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate.
The Number System	Distance on the Coordinate Plane II 6.1.3.d Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane including the use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
Expressions and Equations	Understanding Exponents 6.2.1.a Write and evaluate numerical expressions involving whole-number exponents. Evaluating Expressions and Equations with Exponents 6.2.1.a Write and evaluate numerical expressions involving whole-number exponents. 6.2.1.b Write, read, and evaluate expressions in which letters stand for numbers. 6.2.1.b.iii Evaluate expressions at specific values of their variables including expressions that arise from formulas used in real-world problems. 6.2.1.b.iv 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).

Unit	*Lesson & Standards Addressed*
Statistics and Probability	Measures of Spread - Range 6.3.1.b Demonstrate that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. 6.3.1.c Explain 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. Measures of Center - Median 6.3.1.b Demonstrate that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. 6.3.1.d.ii Summarize numerical data sets in relation to their context. 6.3.1.d.ii.3 Give quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. Measures of Center - Mean 6.3.1.b Demonstrate that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. 6.3.1.d.ii Summarize numerical data sets in relation to their context. 6.3.1.d.ii.3 Give quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. Deviation from the Mean 6.3.1.d.ii Summarize numerical data sets in relation to their context. 6.3.1.d.ii.3 Give quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. Summarizing Data 6.3.1.b Demonstrate that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. 6.3.1.d.ii Summarize numerical data sets in relation to their context. 6.3.1.d.ii.1 Report the number of observations. 6.3.1.d.ii.2 Describe the nature of the attribute under investigation, including how it was measured and its units of measurement. 6.3.1.d.ii.3 Give quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. 6.3.1.d.ii.4 Relate the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. Data Analysis 6.3.1.a Identify a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. Bar Graphs and Histograms 6.3.1.d.i Display numerical data in plots on a number line, including dot plots, histograms, and box plots. Circle Graphs 6.3.1.d.i Display numerical data in plots on a number line, including dot plots, histograms, and box plots. 6.1.1.c 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 diagrams, or equations. 6.1.1.c.iv Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity). 6.1.1.c.v Solve problems involving finding the whole, given a part and the percent.

Unit	*Lesson & Standards Addressed*
Statistics and Probability (continued)	Stem-and-Leaf Plots 6.3.1.b Demonstrate that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. 6.3.1.d.i Display numerical data in plots on a number line, including dot plots, histograms, and box plots. 6.3.1.d.ii Summarize numerical data sets in relation to their context. 6.3.1.d.ii.3 Give quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. Quartiles 6.3.1.b Demonstrate that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. 6.3.1.c Explain 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. Box Plots 6.3.1.b Demonstrate that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. 6.3.1.d.i Display numerical data in plots on a number line, including dot plots, histograms, and box plots. 6.3.1.d.ii Summarize numerical data sets in relation to their context. 6.3.1.d.ii.3 Give quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
Expressions and Equations	Introduction to the Language of Algebra 6.2.1.b Write, read, and evaluate expressions in which letters stand for numbers. 6.2.1.b.i Write expressions that record operations with numbers and with letters standing for numbers. 6.2.2.c Use variables to represent numbers and write expressions when solving a real-world or mathematical problem. 6.2.2.c.i understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. Combining Like Terms 6.2.1.c Apply the properties of operations to generate equivalent expressions. 6.2.1.d Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). Introduction to Solving Word Problems with Algebra 6.2.2.d Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers. Concept of Inequalities I 6.2.2.e Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. 6.2.2.f Show that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

Unit	*Lesson & Standards Addressed*
Expressions and Equations	Solving and Modeling Two-Step Problems 7.2.2.c 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. 7.2.2.c.i Fluently solve word 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. 7.2.2.c.ii Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. Solving Equations with the Distributive Property 7.2.2.c 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. 7.2.2.c.i Fluently solve word 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. 7.2.2.c.ii Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. Solving Equations with the Distributive Property in Context 7.2.2.c 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. 7.2.2.c.i Fluently solve word 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. 7.2.2.c.ii Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
Ratios and Proportional Relationships	Interpreting Unit Rates on Graphs 7.1.1.c Identify and represent proportional relationships between quantities. 7.1.1.c.ii Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. Proportion Concepts 7.1.1.c Identify and represent proportional relationships between quantities. 7.1.1.c.i Determine 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. 7.1.1.c.iii Represent proportional relationships by equations. Proportional Relationships in Tables and Equations 7.1.1.c Identify and represent proportional relationships between quantities. 7.1.1.c.i Determine 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. 7.1.1.c.iii Represent proportional relationships by equations. Interpreting Points on Graphs of Proportional Relationships 7.1.1.b Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. 7.1.1.c Identify and represent proportional relationships between quantities. 7.1.1.c.iv 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. Using Proportions to Solve Problems 7.1.1.d Use proportional relationships to solve multistep ratio and percent problems. 7.4.1.a.i Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

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Unit	Lesson & Standards Addressed
Ratios and Proportional Relationships (continued)	Proportions in Scale Drawings 7.1.1.d Use proportional relationships to solve multistep ratio and percent problems. 7.4.1.a.i Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. Introduction to Similar Figures 7.1.1.c Identify and represent proportional relationships between quantities. 7.1.1.c.iii Represent proportional relationships by equations.7.4.1.a.i Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. Using Similar Figures to Solve Problems 7.1.1.c Identify and represent proportional relationships between quantities. 7.1.1.c.iii Represent proportional relationships by equations.7.4.1.a.i Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. Similarity 7.4.1.a.i Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
Expressions and Equations	Fraction, Decimal, and Percent Equivalents 7.2.2.a Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. 7.2.2.b Apply properties of operations to calculate with numbers in any form, convert between forms as appropriate, and assess the reasonableness of answers using mental computation and estimation strategies.
Ratios and Proportional Relationships	Percent and Percent Change 7.1.1.d Use proportional relationships to solve multistep ratio and percent problems. Percent and Percent Error 7.1.1.d Use proportional relationships to solve multistep ratio and percent problems. Simple Interest 7.1.1.d Use proportional relationships to solve multistep ratio and percent problems.
The Number System	Adding and Subtracting Rational Numbers I 7.1.2.a Apply understandings of addition and subtraction to add and subtract rational numbers including integers. 7.1.2.a.ii Describe situations in which opposite quantities combine to make 0. 7.1.2.a.iii Demonstrate 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. 7.1.2.a.iv Show that a number and its opposite have a sum of 0 (are additive inverses). 7.1.2.a.v Interpret sums of rational numbers by describing real-world contexts. 7.1.2.a.viii Apply properties of operations as strategies to add and subtract rational numbers. Adding and Subtracting Rational Numbers II 7.1.2.a Apply understandings of addition and subtraction to add and subtract rational numbers including integers. 7.1.2.a.vi Demonstrate subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). 7.1.2.a.vii 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.

Unit	Lesson & Standards Addressed
The Number System (continued)	Multiplying and Dividing Rational Numbers 7.1.2.b Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers including integers. 7.1.2.b.i Apply properties of operations to multiplication of rational numbers. 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. 7.1.2.b.ii Interpret products of rational numbers by describing real-world contexts. 7.1.2.b.iii Apply properties of operations to divide integers. 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. 7.1.2.b.iv Apply properties of operations as strategies to multiply and divide rational numbers. 7.1.2.b.v Convert a rational number to a decimal using long division. 7.1.2.b.vi Show that the decimal form of a rational number terminates in 0s or eventually repeats. Writing and Interpreting Expressions with Rational Numbers 7.1.2.c 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. 7.2.2.a Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. 7.2.2.b Apply properties of operations to calculate with numbers in any form, convert between forms as appropriate, and assess the reasonableness of answers using mental computation and estimation strategies. Operations with Rational Numbers I 7.1.2.c 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. Operations with Rational Numbers II 7.2.2.a Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. 7.2.2.b Apply properties of operations to calculate with numbers in any form, convert between forms as appropriate, and assess the reasonableness of answers using mental computation and estimation strategies.
Geometry	Circumference 7.4.2.a State the formulas for the area and circumference of a circle and use them to solve problems. 7.4.2.b Give an informal derivation of the relationship between the circumference and area of a circle. Area of Circles 7.4.2.a State the formulas for the area and circumference of a circle and use them to solve problems. 7.4.2.b Give an informal derivation of the relationship between the circumference and area of a circle. Area of Complex Composite Figures 7.4.2.d Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. Surface Area and Volume of Rectangular Prisms 7.4.2.d Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. Surface Area of Cylinders 7.4.2.a State the formulas for the area and circumference of a circle and use them to solve problems. 7.4.2.b Give an informal derivation of the relationship between the circumference and area of a circle. 7.4.2.d Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. Surface Area of Pyramids 7.4.2.d Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Unit	Lesson & Standards Addressed
Geometry (continued)	Surface Area of Cones 7.4.2.a State the formulas for the area and circumference of a circle and use them to solve problems. 7.4.2.b Give an informal derivation of the relationship between the circumference and area of a circle. 7.4.2.d Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. Surface Area of Spheres 7.4.2.d Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. Surface Area of Composite Solids 7.4.2.a State the formulas for the area and circumference of a circle and use them to solve problems. 7.4.2.b Give an informal derivation of the relationship between the circumference and area of a circle. 7.4.2.d Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. Angle Pairs 7.4.2.c Use properties of supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. Angles in a Polygon 7.4.2.c Use properties of supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
Statistics and Probability	Sampling 7.3.1.a.iii Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. 7.3.1.a.iv Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. 7.3.1.b.ii Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. Comparing Data 7.3.1.b.i Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. Simple Probability 7.3.2.a Explain that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. 7.3.2.c Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. 7.3.2.c.iii Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.

Unit	*Lesson & Standards Addressed*
Statistics and Probability (continued)	Compound Probability 7.3.2.a Explain that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. 7.3.2.c Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. 7.3.2.c.ii Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. 7.3.2.d Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. 7.3.2.d.i Explain that the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. 7.3.2.d.ii Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. 7.3.2.d.iii For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event. Making Predictions 7.3.2.b Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. Simulations of Simple and Compound Events 7.3.2.d Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. 7.3.2.d.iv Design and use a simulation to generate frequencies for compound events.
Expressions and Equations	Solving Word Problems with Algebra 7.2.1.a.ii Demonstrate that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. Common Factors in Polynomials 7.2.1.a.i Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. Concept of Inequalities II 7.2.2.c 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. 7.2.2.c.iii Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. 7.2.2.c.iv Graph the solution set of the inequality and interpret it in the context of the problem.

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Unit	Lesson & Standards Addressed
Expressions and Equations	Solving Two-Step Equations 8.2.2.a Solve linear equations in one variable. 8.2.2.a.ii Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Understanding Properties of Integer Exponents 8.1.1.d Apply the properties of integer exponents to generate equivalent numerical expressions. Applying Properties of Integer Exponents 8.1.1.d Apply the properties of integer exponents to generate equivalent numerical expressions.
Functions	Interpreting Graphs of Real-World Situations 8.2.3.b.iv Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). 8.2.3.b.v Sketch a graph that exhibits the qualitative features of a function that has been described verbally. Introduction to Sketching Graphs of Real-World Situations 8.2.3.b.iv Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). 8.2.3.b.v Sketch a graph that exhibits the qualitative features of a function that has been described verbally.
Expressions and Equations	Interpreting Slope 8.2.1.b Graph proportional relationships, interpreting the unit rate as the slope of the graph. 8.2.1.c Compare two different proportional relationships represented in different ways. Slope 8.2.1.d 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. 8.2.1.e Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. 8.2.3.a.i Define a function as a rule that assigns to each input exactly one output. 8.2.3.a.ii Show that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output. 8.2.3.a.iii Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
Functions	Slope-Intercept Form 8.2.1.d 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. 8.2.1.e Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. 8.2.3.b.i Construct a function to model a linear relationship between two quantities. 8.2.3.b.ii 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. 8.2.3.b.iii 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. 8.3.1.d Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. Point-Slope Form 8.2.3.a.iv Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line. 8.2.3.b.i Construct a function to model a linear relationship between two quantities. 8.2.3.b.ii 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. 8.2.3.b.iii 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.

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Unit	Lesson & Standards Addressed
Expressions and Equations	Solving a System of Linear Equations Graphically 8.2.2.b Analyze and solve pairs of simultaneous linear equations. 8.2.2.b.i Explain 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. Solving a System of Linear Equations Algebraically 8.2.2.b Analyze and solve pairs of simultaneous linear equations. 8.2.2.b.ii Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. Solving a System of Linear Equations - Applications 8.2.2.b.iii Solve real-world and mathematical problems leading to two linear equations in two variables.
Building Functions	Direct Variation 8.3.1.c Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. 8.3.1.d Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
Statistics and Probability	Comparing Linear and Nonlinear Functions 8.3.1.a Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. 8.3.1.b Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. 8.3.1.c Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
Expressions and Equations	Analyzing Solution Sets to Linear Equations with the Variable on Both Sides 8.2.2.a.i 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). Solving Equations with the Variable on Both Sides 8.2.2.a Solve linear equations in one variable. 8.2.2.a.ii Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Understanding Square and Cube Roots 8.1.1.e 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. 8.1.1.f Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that the square root of 2 is irrational. Approximating Values of Irrational Numbers 8.1.1.a Define irrational numbers. Know that numbers that are not rational are called irrational. 8.1.1.b Demonstrate informally that every number has a decimal expansion. 8.1.1.b.i For rational numbers show that the decimal expansion repeats eventually. 8.1.1.b.ii Convert a decimal expansion which repeats eventually into a rational number. 8.1.1.c Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). Interpreting Numbers Written in Scientific Notation 8.1.1.g 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.

Unit	Lesson & Standards Addressed
Expressions and Equations (continued)	Operations with Numbers in Scientific Notation 8.1.1.h Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. 8.1.1.h.i 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). 8.1.1.h.ii Interpret scientific notation that has been generated by technology.
Geometry	Angles in a Polygon 8.4.1.g Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. Volume of Cylinders 8.4.2.d State the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. Volume of Pyramids and Cones 8.4.2.d State the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. Volume of Spheres 8.4.2.d State the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. Volume of Composite Solids 8.4.2.d State the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. Parallel Lines and Transversals 8.4.1.g Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. Understanding the Pythagorean Theorem 8.4.2.a Explain a proof of the Pythagorean Theorem and its converse. Pythagorean Theorem - Hypotenuse 8.4.2.b Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. Pythagorean Theorem - Legs 8.4.2.b Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. Pythagorean Theorem - Mixed Problems 8.4.2.b Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. Pythagorean Theorem - Distance Formula 8.4.2.b Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. 8.4.2.c Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. Translations 8.4.1.c Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. 8.4.1.d Given two congruent figures, describe a sequence that exhibits the congruence between them. 8.4.1.b Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.4.1.e Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. 8.4.1.f Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Unit	*Lesson & Standards Addressed*
Geometry (continued)	Reflections 8.4.1.c Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. 8.4.1.d Given two congruent figures, describe a sequence that exhibits the congruence between them. 8.4.1.b Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.4.1.e Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. 8.4.1.f Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. Rotations 8.4.1.c Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. 8.4.1.d Given two congruent figures, describe a sequence that exhibits the congruence between them. 8.4.1.b Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.4.1.e Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. 8.4.1.f Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. Composition of Transformations 8.4.1.c Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. 8.4.1.d Given two congruent figures, describe a sequence that exhibits the congruence between them. 8.4.1.b Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.4.1.e Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. 8.4.1.f Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. Dilations 8.4.1.b Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.4.1.e Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. 8.4.1.f Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. Congruence 8.4.1.c Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. 8.4.1.d Given two congruent figures, describe a sequence that exhibits the congruence between them.
Statistics and Probability	Patterns of Association in Data 8.SP.A.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

Unit	*Lesson & Standards Addressed*
Expressions and Equations	Solving Two-Step Equations 8.2.2.a Solve linear equations in one variable. 8.2.2.a.ii Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Understanding Properties of Integer Exponents 8.1.1.d Apply the properties of integer exponents to generate equivalent numerical expressions. Applying Properties of Integer Exponents 8.1.1.d Apply the properties of integer exponents to generate equivalent numerical expressions.
Functions	Interpreting Graphs of Real-World Situations 8.2.3.b.iv Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). 8.2.3.b.v Sketch a graph that exhibits the qualitative features of a function that has been described verbally. Introduction to Sketching Graphs of Real-World Situations 8.2.3.b.iv Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). 8.2.3.b.v Sketch a graph that exhibits the qualitative features of a function that has been described verbally.
Expressions and Equations	Interpreting Slope 8.2.1.b Graph proportional relationships, interpreting the unit rate as the slope of the graph. 8.2.1.c Compare two different proportional relationships represented in different ways. Slope 8.2.1.d 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. 8.2.1.e Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. 8.2.3.a.i Define a function as a rule that assigns to each input exactly one output. 8.2.3.a.ii Show that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output. 8.2.3.a.iii Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
Functions	Slope-Intercept Form 8.2.1.d 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. 8.2.1.e Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. 8.2.3.b.i Construct a function to model a linear relationship between two quantities. 8.2.3.b.ii 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. 8.2.3.b.iii 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. 8.3.1.d Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. Point-Slope Form 8.2.3.a.iv Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line. 8.2.3.b.i Construct a function to model a linear relationship between two quantities. 8.2.3.b.ii 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. 8.2.3.b.iii 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.

Unit	*Lesson & Standards Addressed*
Expressions and Equations	Solving a System of Linear Equations Graphically 8.2.2.b Analyze and solve pairs of simultaneous linear equations. 8.2.2.b.i Explain 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. Solving a System of Linear Equations Algebraically 8.2.2.b Analyze and solve pairs of simultaneous linear equations. 8.2.2.b.ii Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. Solving a System of Linear Equations - Applications 8.2.2.b.iii Solve real-world and mathematical problems leading to two linear equations in two variables.
Building Functions	Direct Variation 8.3.1.c Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. 8.3.1.d Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
Statistics and Probability	Comparing Linear and Nonlinear Functions 8.3.1.a Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. 8.3.1.b Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. 8.3.1.c Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
Expressions and Equations	Analyzing Solution Sets to Linear Equations with the Variable on Both Sides 8.2.2.a.i 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). Solving Equations with the Variable on Both Sides 8.2.2.a Solve linear equations in one variable. 8.2.2.a.ii Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Understanding Square and Cube Roots 8.1.1.e 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. 8.1.1.f Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that the square root of 2 is irrational. Approximating Values of Irrational Numbers 8.1.1.a Define irrational numbers. Know that numbers that are not rational are called irrational. 8.1.1.b Demonstrate informally that every number has a decimal expansion. 8.1.1.b.i For rational numbers show that the decimal expansion repeats eventually. 8.1.1.b.ii Convert a decimal expansion which repeats eventually into a rational number. 8.1.1.c Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). Interpreting Numbers Written in Scientific Notation 8.1.1.g 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.

Unit	*Lesson & Standards Addressed*
Expressions and Equations (continued)	Operations with Numbers in Scientific Notation 8.1.1.h Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. 8.1.1.h.i 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). 8.1.1.h.ii Interpret scientific notation that has been generated by technology.
Geometry	Angles in a Polygon 8.4.1.g Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. Volume of Cylinders 8.4.2.d State the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. Volume of Pyramids and Cones 8.4.2.d State the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. Volume of Spheres 8.4.2.d State the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. Volume of Composite Solids 8.4.2.d State the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. Parallel Lines and Transversals 8.4.1.g Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. Understanding the Pythagorean Theorem 8.4.2.a Explain a proof of the Pythagorean Theorem and its converse. Pythagorean Theorem - Hypotenuse 8.4.2.b Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. Pythagorean Theorem - Legs 8.4.2.b Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. Pythagorean Theorem - Mixed Problems 8.4.2.b Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. Pythagorean Theorem - Distance Formula 8.4.2.b Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. 8.4.2.c Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. Translations 8.4.1.c Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. 8.4.1.d Given two congruent figures, describe a sequence that exhibits the congruence between them. 8.4.1.b Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.4.1.e Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. 8.4.1.f Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Unit	*Lesson & Standards Addressed*
Geometry (continued)	Reflections 8.4.1.c Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. 8.4.1.d Given two congruent figures, describe a sequence that exhibits the congruence between them. 8.4.1.b Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.4.1.e Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. 8.4.1.f Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. Rotations 8.4.1.c Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. 8.4.1.d Given two congruent figures, describe a sequence that exhibits the congruence between them. 8.4.1.b Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.4.1.e Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. 8.4.1.f Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. Composition of Transformations 8.4.1.c Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. 8.4.1.d Given two congruent figures, describe a sequence that exhibits the congruence between them. 8.4.1.b Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.4.1.e Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. 8.4.1.f Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. Dilations 8.4.1.b Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.4.1.e Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. 8.4.1.f Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. Congruence 8.4.1.c Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. 8.4.1.d Given two congruent figures, describe a sequence that exhibits the congruence between them.
Statistics and Probability	Patterns of Association in Data 8.SP.A.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

Algebra I Colorado Learning Pathway

Unit	Lesson & Standards Addressed
Quantities	Using Units to Solve Problems HS.1.2.a.i Use units as a way to understand problems and to guide the solution of multi-step problems. HS.1.2.a.i.1 Choose and interpret units consistently in formulas. HS.1.2.a.iii Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Linear, Quadratic, and Exponential Models	Introduction to Nonlinear Models HS.2.2.a.iii Use graphs and tables to describe that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
Seeing Structure in Expressions	Interpreting the Structure of Linear and Exponential Expressions HS.2.3.a.i Interpret expressions that represent a quantity in terms of its context. HS.2.3.a.i.1 Interpret parts of an expression, such as terms, factors, and coefficients. HS.2.3.a.i.2 Interpret complicated expressions by viewing one or more of their parts as a single entity.
Creating Equations	Writing and Solving Linear Equations in One Variable HS.2.4.a.i Create equations and inequalities in one variable and use them to solve problems. HS.2.4.a.iii Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. Writing and Graphing Linear Equations in Two or More Variables HS.2.4.a.ii Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. Equations of Parallel and Perpendicular Lines HS.2.4.a.ii Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. Writing Linear Inequalities in One Variable HS.2.4.a.i Create equations and inequalities in one variable and use them to solve problems. HS.2.4.a.iii Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.
Reasoning with Equations and Inequalities	Solving Linear Inequalities in One Variable HS.2.4.c.i Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Creating Equations	Modeling Exponential Relationships with Equations, Inequalities, and Graphs HS.2.4.a.i Create equations and inequalities in one variable and use them to solve problems. HS.2.4.a.ii Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
Reasoning with Equations and Inequalities	Solving Linear Equations in One Variable as a Reasoning Process HS.2.4.b.i Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. HS.2.4.c.i Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Creating Equations	Solving Literal Equations HS.2.4.a.iv Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Unit	Lesson & Standards Addressed
Reasoning with Equations and Inequalities	Solving Systems of Linear Equations HS.2.4.d.i Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. HS.2.4.d.ii Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. Solving Linear Equations Graphically HS.2.4.e.i Explain that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve. HS.2.4.e.ii Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately. Solving Exponential Equations Graphically HS.2.4.e.i Explain that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve. HS.2.4.e.ii Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately. Graphing Linear Inequalities and Systems of Linear Inequalities in Real-World Situations HS.2.4.e.iii Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. HS.2.4.a.iii Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.
Interpreting Functions	Function Notation I HS.2.1.a.i Explain that a function is a correspondence from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range. HS.2.1.a.ii Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. Function Notation II HS.2.1.a.i Explain that a function is a correspondence from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range. HS.2.1.a.ii Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. Interpreting Graphs of Linear and Exponential Functions in Context HS.2.1.b.i For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Sketching Graphs of Linear and Exponential Functions from a Context HS.2.1.b.i For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Understanding the Domain of a Function HS.2.1.b.ii Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

Unit	Lesson & Standards Addressed
Interpreting Functions (continued)	Rate of Change for Linear and Exponential Functions HS.2.1.b.iii Calculate and interpret the average rate of change of a function over a specified interval. Estimate the rate of change from a graph. Sketching Graphs of Linear Functions from Symbolic Representations HS.2.1.c.i Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. HS.2.1.c.ii Graph linear and quadratic functions and show intercepts, maxima, and minima. Sketching Graphs of Exponential Functions from Symbolic Representations HS.2.1.c.i Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. HS.2.1.c.v Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
Building Functions	Transformations of Graphs of Linear and Exponential Functions HS.2.1.e.i Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k, and find the value of k given the graphs. HS.2.1.e.ii Experiment with cases and illustrate an explanation of the effects on the graph using technology.
Interpreting Functions	Comparing Functions Using Different Representations HS.2.1.c.vi.3 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
Linear, Quadratic, and Exponential Functions	Distinguishing Between Linear and Exponential Relationships HS.2.2.a.i Distinguish between situations that can be modeled with linear functions and with exponential functions. HS.2.2.a.i.1 Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. HS.2.2.a.i.2 Identify situations in which one quantity changes at a constant rate per unit interval relative to another. HS.2.2.a.i.3 Identify situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
Building Functions	Writing Linear and Exponential Functions from a Context HS.2.1.d.i Write a function that describes a relationship between two quantities. HS.2.1.d.i.1 Determine an explicit expression, a recursive process, or steps for calculation from a context.
Linear, Quadratic, and Exponential Models	Writing Linear and Exponential Functions Based on Different Representations HS.2.2.a.ii Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs.
Building Functions	Composite Functions HS.2.1.d.i Write a function that describes a relationship between two quantities. HS.2.1.d.i.2 Combine standard function types using arithmetic operations. Writing Arithmetic Sequences Explicitly and Recursively HS.2.1.d.ii Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. Writing Geometric Sequences Using an Explicit Formula HS.2.1.d.ii Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. Writing Geometric Sequences Recursively HS.2.1.d.ii Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
Interpreting Functions	Sequences as Functions HS.2.1.a.iii Demonstrate that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

Unit	Lesson & Standards Addressed
Interpreting Categorical and Quantitative Data	Data Displays on the Real Number Line HS.3.1.a.i Represent data with plots on the real number line (dot plots, histograms, and box plots). Comparing the Shape, Center, and Spread of Data Sets HS.3.1.a.ii Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. HS.3.1.a.iii Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). Summarizing and Interpreting Categorical Data HS.3.1.b.i Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. Fitting Functions to Data HS.3.1.b.ii Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. HS.3.1.b.ii.1 Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. HS.3.1.b.ii.3 Fit a linear function for a scatter plot that suggests a linear association. Correlation HS.3.1.c.iii Distinguish between correlation and causation.
Arithmetic with Polynomials and Rational Expressions	Adding and Subtracting Polynomials HS.2.3.c.i Explain that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. Multiplying Polynomials HS.2.3.c.i Explain that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
The Real Number System	Products and Sums with Rational and Irrational Numbers HS.1.1.b.i Explain why the sum or product of two rational numbers is rational. HS.1.1.b.ii Explain why the sum of a rational number and an irrational number is irrational. HS.1.1.b.iii Explain why the product of a nonzero rational number and an irrational number is irrational. Using Rational Exponents to Rewrite Expressions HS.1.1.a.i Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. HS.1.1.a.ii Rewrite expressions involving radicals and rational exponents using the properties of exponents.
Interpreting Functions	Rewriting and Interpreting Exponential Functions in Terms of Context HS.2.3.b.i Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. HS.2.3.b.i.3 Use the properties of exponents to transform expressions for exponential functions. HS.2.1.c.vi Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. HS.2.1.c.vi.2 Use the properties of exponents to interpret expressions for exponential functions. HS.2.2.b.i Interpret the parameters in a linear or exponential function in terms of a context.
Seeing Structure in Expressions	Interpreting the Structure of Quadratic Expressions and Expressions with Rational Exponents HS.2.3.a.i Interpret expressions that represent a quantity in terms of its context. HS.2.3.a.i.1 Interpret parts of an expression, such as terms, factors, and coefficients. HS.2.3.a.i.2 Interpret complicated expressions by viewing one or more of their parts as a single entity.
Creating Equations	Modeling Quadratic Relationships with Equations, Inequalities, and Graphs HS.2.4.a.i Create equations and inequalities in one variable and use them to solve problems. HS.2.4.a.ii Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HS.2.4.a.iv Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Unit	*Lesson & Standards Addressed*
Building Functions	Writing Quadratic Functions from a Context HS.2.1.d.i Write a function that describes a relationship between two quantities. HS.2.1.d.i.1 Determine an explicit expression, a recursive process, or steps for calculation from a context. HS.2.1.d.i.2 Combine standard function types using arithmetic operations. Writing Quadratic Functions from Their Graphs HS.2.4.e.i Explain that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve. HS.2.1.c.vi Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. HS.2.1.d.i Write a function that describes a relationship between two quantities.
Interpreting Functions	Sketching Graphs of Quadratic Functions in Context HS.2.1.b.i For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. HS.2.1.b.ii Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. HS.2.1.b.iii Calculate and interpret the average rate of change of a function over a specified interval. Estimate the rate of change from a graph. Sketching and Transforming Graphs of Quadratic Functions from Symbolic Representations HS.2.1.c.i Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. HS.2.1.c.ii Graph linear and quadratic functions and show intercepts, maxima, and minima. HS.2.1.e.i Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k, and find the value of k given the graphs.
Seeing Structure in Expressions	Factoring Quadratic Expressions HS.2.3.a.ii Use the structure of an expression to identify ways to rewrite it. HS.2.3.b.i Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. HS.2.3.b.i.1 Factor a quadratic expression to reveal the zeros of the function it defines.
Reasoning with Equations and Inequalities	Solving Quadratics - Completing the Square HS.2.4.c.ii Solve quadratic equations in one variable. HS.2.4.c.ii.1 Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
Interpreting Functions	Rewriting Quadratics to Reveal Their Structure HS.2.3.b.i Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. HS.2.3.b.i.2 Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. HS.2.1.c.vi Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. HS.2.1.c.vi.1 Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

Unit	*Lesson & Standards Addressed*
Reasoning with Equations and Inequalities	Problem Solving with Quadratic Functions HS.2.4.c.ii Solve quadratic equations in one variable. HS.2.4.c.ii.2 Solve quadratic equations by inspection, taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. HS.2.4.c.ii.3 Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b. Using the Quadratic Formula HS.2.4.c.ii Solve quadratic equations in one variable. HS.2.4.c.ii.2 Solve quadratic equations by inspection, taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. HS.2.4.c.ii.3 Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b. Solving a System of Linear and Quadratic Equations HS.2.4.d.iii Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
Interpreting Functions	Piecewise, Step, and Absolute Value Functions HS.2.1.c.i Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. HS.2.1.c.iii Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
Building Functions	Writing Inverse Functions HS.2.1.e.iii Find inverse functions.

Unit	*Lesson & Standards Addressed*
Congruence	Defining Basic Geometric Elements HS.4.1.a.i State precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. Defining Transformations HS.4.1.a.vi Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. Rotational and Reflectional Symmetry HS.4.1.a.v Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Representing Transformations with Algebra HS.4.1.a.ii Represent transformations in the plane using appropriate tools, e.g., transparencies and geometry software. HS.4.1.a.iii Describe transformations as functions that take points in the plane as inputs and give other points as outputs. HS.4.1.a.iv Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). Rigid Motion and Congruence HS.4.1.a.vii Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. HS.4.1.a.viii Specify a sequence of transformations that will carry a given figure onto another. HS.1.b.i Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure. HS.4.1.b.ii Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. What is Proof? HS.4.1.b.iii Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. HS.4.1.c.i Prove theorems about lines and angles. Proving Theorems About Lines and Angles HS.4.1.c.i Prove theorems about lines and angles. Proving Theorems About Congruent Triangles HS.4.1.b.iv Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. HS.4.1.c.ii Prove theorems about triangles.
Similarity, Right Triangles, and Trigonometry	Problem Solving with Congruent Triangles HS.4.1.c.ii Prove theorems about triangles. HS.4.2.b.iii Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
Congruence	Proving Theorems About Relationships in Triangles HS.4.1.c.ii Prove theorems about triangles. Proving Theorems About Parallelograms HS.4.1.c.iii Prove theorems about parallelograms. Constructing Angles and Special Line Segments HS.4.1.d.i Make formal geometric constructions with a variety of tools and methods. Constructing Inscribed Figures HS.4.1.d.ii Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Geometry Colorado Learning Pathway

Unit	*Lesson & Standards Addressed*
Modeling with Geometry	Modeling Objects with Geometric Figures HS.4.5.a.i Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Using Geometric Relationships to Solve Design Problems HS.4.5.a.iii Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Similarity, Right Triangles, and Trigonometry	Properties of Dilations I HS.4.2.a.i Verify experimentally the properties of dilations given by a center and a scale factor. HS.4.2.a.i.2 The dilation of a line segment is longer or shorter in the ratio given by the scale factor. Properties of Dilations II HS.4.2.a.i Verify experimentally the properties of dilations given by a center and a scale factor. HS.4.2.a.i.1 Show that a dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. Transformations and Similarity HS.4.2.a.ii Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar. HS.4.2.a.iii Explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. HS.4.2.a.iv Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. Problem Solving with Transformations and Similarity HS.4.2.b.iii Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
Geometry	Pythagorean Theorem - Hypotenuse HS.4.2.c.iii Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. Pythagorean Theorem - Legs HS.4.2.c.iii Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. Pythagorean Theorem - Mixed Problems HS.4.2.c.iii Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
Similarity, Right Triangles, and Trigonometry	Proving Theorems About Similar Triangles HS.4.2.b.i Prove theorems about triangles. Similarity and Trigonometric Ratios HS.4.2.c.i Explain that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. Problem Solving with Similarity and Trigonometric Ratios HS.4.2.c.iii Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. Sine and Cosine of Complementary Angles HS.4.2.c.ii Explain and use the relationship between the sine and cosine of complementary angles.
Geometry	Volume of Cylinders HS.4.4.a.ii Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. Volume of Pyramids and Cones HS.4.4.a.ii Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. Volume of Spheres HS.4.4.a.ii Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Geometry Colorado Learning Pathway

Unit	Lesson & Standards Addressed
Modeling with Geometry	Rates with Area and Volume HS.4.5.a.ii Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
Geometric Measurement and Dimension	Understanding Formulas for Curved Figures HS.4.4.a.i Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments. Cross-Sections of 3-Dimensional Figures HS.4.4.b.i Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
Expressing Geometric Properties with Equations	Coordinates of Parallel and Perpendicular Lines HS.4.3.a.ii.1 Use coordinates to prove simple geometric theorems algebraically. HS.4.3.a.ii.2 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). Problem Solving with Coordinates of Parallel and Perpendicular Lines HS.4.3.a.ii.1 Use coordinates to prove simple geometric theorems algebraically. Dividing a Segment Proportionally HS.4.3.a.ii.3 Find the point on a directed line segment between two given points that partitions the segment in a given ratio. Using Coordinates to Find Perimeters and Areas HS.4.3.a.ii.4 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles.
Circles	Tangents, Chords, Radii, and Angles in Circles HS.4.2.e.i Identify and describe relationships among inscribed angles, radii, and chords. Radians and Area of Sectors HS.4.2.f.i Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality. HS.4.2.f.ii Derive the formula for the area of a sector.
Expressing Geometric Properties with Equations	Equation of a Circle HS.4.3.a.i.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem. HS.4.3.a.i.2 Complete the square to find the center and radius of a circle given by an equation. HS.4.2.b.ii Prove that all circles are similar. Problem Solving with the Equation of a Circle HS.4.3.a.i.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem. HS.4.3.a.i.2 Complete the square to find the center and radius of a circle given by an equation. HS.4.3.a.ii.1 Use coordinates to prove simple geometric theorems algebraically. Deriving the Equation of a Parabola from Its Definition HS.4.3.a.i.3 Derive the equation of a parabola given a focus and directrix.
Circles	Quadrilaterals Inscribed in Circles HS.4.2.e.ii Construct the inscribed and circumscribed circles of a triangle. HS.4.2.e.iii Prove properties of angles for a quadrilateral inscribed in a circle.
Similarity, Right Triangles, and Trigonometry	Law of Sines and Law of Cosines HS.4.2.c Define trigonometric ratios and solve problems involving right triangles.

Unit	*Lesson & Standards Addressed*
Conditional Probability and the Rules of Probability	Organizing Possible Outcomes of Events HS.3.3.a.i Describe events as subsets of a sample space using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events. Using Area Models for Compound Probability HS.3.3.a.v Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. Understanding Independent and Dependent Events HS.3.3.a.ii Explain that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. Understanding Conditional Probability HS.3.3.a.iii Using the conditional probability of A given B as P(A and B)/P(B), interpret the independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. HS.3.3.b.i Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model. Modeling Probability Situations Using Two-Way Frequency Tables HS.3.3.a.iv Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. HS.3.3.b.i Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model. Relating Probabilities of Unions and Intersections of Events HS.3.3.b.ii Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model.