**Sixth Grade Foundations: In sixth grade, students focus on several key areas:**

* **Ratios and Proportional Relationships**: Understanding and using ratios to solve problems.
* **The Number System**: Extending knowledge of multiplication and division to divide fractions by fractions.
* **Expressions and Equations**: Developing skills to write, interpret, and evaluate expressions and equations.
* **Geometry**: Solving problems involving area, surface area, and volume.
* **Statistics and Probability**: Developing understanding of statistical variability and distributions.

**Progression to Calculus**

* **Ratios and Proportional Relationships**: Lead to understanding linear functions and slope in Algebra.
* **The Number System**: Expands to include rational and irrational numbers, essential for higher-level algebra and calculus.
* **Expressions and Equations**: Develop into solving complex equations and systems of equations in Algebra II and Pre-Calculus.
* **Geometry**: Progresses to include proofs, theorems, and trigonometry, which are vital for Calculus.
* **Statistics and Probability**: Forms the basis for data analysis and inferential statistics encountered in advanced mathematics.

**Cross Over Standards from 6th to 7th grade**

**1. Ratios and Proportional Relationships**

* **6th Grade (6.RP.A):** Students understand ratio concepts and use ratio reasoning to solve problems.
* **7th Grade (7.RP.A):** This understanding is expanded as students analyze proportional relationships and use them to solve real-world and mathematical problems.

**2. The Number System**

* **6th Grade (6.NS):** Focuses on dividing fractions by fractions, computing fluently with multi-digit numbers, and finding common factors and multiples.
* **7th Grade (7.NS):** Extends this knowledge to include operations with rational numbers, building on the foundational skills from sixth grade.

**3. Expressions and Equations**

* **6th Grade (6.EE):** Students apply and extend previous understandings of arithmetic to algebraic expressions, reason about and solve one-variable equations and inequalities, and analyze quantitative relationships between dependent and independent variables.
* **7th Grade (7.EE):** This progresses to using properties of operations to generate equivalent expressions and solving real-life and mathematical problems using numerical and algebraic expressions and equations.

**4. Geometry**

* **6th Grade (6.G):** Involves solving problems involving area, surface area, and volume.
* **7th Grade (7.G):** Builds on this by drawing, constructing, and describing geometrical figures and describing the relationships between them, as well as solving problems involving angle measure, area, surface area, and volume.

**5. Statistics and Probability**

* **6th Grade (6.SP):** Develops understanding of statistical variability and summarizes and describes distributions.
* **7th Grade (7.SP):** Advances to using random sampling to draw inferences about populations, drawing informal comparative inferences about two populations, and investigating chance processes and developing, using, and evaluating probability models.

**6th Grade (6.RP.A)** standards in New Mexico, which focus on Ratios and Proportional Relationships, cover the following topics:

**6.RP.A.1: Understanding the Concept of a Ratio**

* **Definition:** A ratio is a comparison of two quantities.
* Students learn how to express ratios using various notations (e.g., 3:4, 3 to 4, or ​).
* Interpret the meaning of ratios in real-world contexts.

**6.RP.A.2: Understanding the Concept of a Unit Rate**

* **Definition:** A unit rate is a ratio that compares quantities where the second quantity is 1 (e.g., 60 miles per hour).
* Students explore how to calculate and interpret unit rates in various contexts.

**6.RP.A.3: Using Ratio and Rate Reasoning to Solve Problems**

Students apply their understanding of ratios and rates to:

1. **6.RP.A.3.a:** **Create Tables of Equivalent Ratios**
   * Solve problems by organizing data into tables and identifying patterns.
   * Plot equivalent ratios on a coordinate plane.
2. **6.RP.A.3.b:** **Solve Unit Rate Problems**
   * Solve real-world problems such as unit pricing and constant speed (e.g., "If apples cost $3 per pound, how much will 4 pounds cost?").
3. **6.RP.A.3.c:** **Solve Percent Problems**
   * Work with percentages as a type of ratio (e.g., finding what is 40% of a number or solving "40% of 80 is what?").
4. **6.RP.A.3.d:** **Convert Measurement Units Using Ratios**
   * Solve problems that require converting units of measurement within the same system or across systems (e.g., converting inches to feet or kilometers to miles).

**7th Grade (7.RP.A)** standards in New Mexico focus on **Ratios and Proportional Relationships**, emphasizing analyzing and solving problems using proportional reasoning. Here are the topics:

**7.RP.A.1: Compute Unit Rates Associated with Ratios of Fractions**

* Calculate unit rates in situations where the given quantities are fractions, including complex fractions.

**7.RP.A.2: Recognize and Represent Proportional Relationships Between Quantities**

**7.RP.A.2.a: Determine Proportionality**

* Identify whether two quantities are in a proportional relationship by:
  + Testing for equivalent ratios in tables.
  + Checking for linear graphs that pass through the origin.

**7.RP.A.2.b: Identify the Constant of Proportionality (Unit Rate)**

* Recognize and compute the constant k (unit rate) in proportional relationships.
  + Represent the relationship as y=kx.

**7.RP.A.2.c: Represent Proportional Relationships**

* Represent proportional relationships using:
  + Equations (e.g., y=5x).
  + Tables of equivalent ratios.
  + Graphs, ensuring they are straight lines passing through the origin.

**7.RP.A.2.d: Explain Proportional Relationships**

* Interpret and explain proportional relationships in context.
  + Example: “For every 3 apples picked, 5 pears are picked.”

**7.RP.A.3: Use Proportional Relationships to Solve Multi-Step Ratio and Percent Problems**

* Apply proportional reasoning to solve real-world and mathematical problems such as:
  + **Discounts, taxes, and tips.**
  + **Markups and markdowns.**
  + **Simple interest.**
  + **Percent increase or decrease.**
  + **Percent error.**
  + **Conversions within and between measurement systems using proportionality.**

**Crossover Curriculum** that Bridges 6th-grade **(6.RP.A)** and 7th-grade **(7.RP.A) Standards**

**1. Review of Foundational Concepts (5th Grade and 6th Grade Skills)**

1. **5.NF.B.7:** Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.
2. **6.NS.C.6:** Understand and use positive and negative numbers, including their placement on the number line.

**2. Building a Foundation with Ratios and Proportions (6th Grade Standards)**

1. **6.RP.A.1:** Understand the concept of a ratio and use ratio language to describe relationships between two quantities.
   * Introduce ratios in real-world contexts (e.g., 3 cups of juice to 2 cups of water).
2. **6.RP.A.2:** Understand the concept of a unit rate associated with a ratio
   * Calculate unit rates and interpret their meanings (e.g., price per item, miles per hour).
3. **6.RP.A.3:** Use ratio and rate reasoning to solve problems, including:
   * **6.RP.A.3.a:** Tables of equivalent ratios and graphing proportional relationships.
   * **6.RP.A.3.b:** Solving unit rate problems, including those with unit pricing and speed.
   * **6.RP.A.3.c:** Solving percent problems (e.g., what is 40% of 250?).
   * **6.RP.A.3.d:** Converting measurement units using ratio reasoning.

**3. Expanding and Applying Proportional Reasoning (7th Grade Standards)**

1. **7.RP.A.1:** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities.
2. **7.RP.A.2:** Analyze proportional relationships and their representations:
   * **7.RP.A.2.a:** Determine whether two quantities are in a proportional relationship using tables, graphs, and equations.
   * **7.RP.A.2.b:** Identify the constant of proportionality (k) in a proportional relationship.
   * **7.RP.A.2.c:** Represent proportional relationships with equations (e.g., y= kx).
   * **7.RP.A.2.d:** Explain what a point (x,y) on the graph of a proportional relationship means in context.
3. **7.RP.A.3:** Solve real-world and multi-step ratio and percent problems:
   * Discounts, taxes, tips, and markups/markdowns.
   * Percent increase or decrease.
   * Percent error and simple interest.

**4. Supplementary Standards to Enhance Understanding**

1. **6.EE.C.9:** Use variables to represent two quantities in a real-world problem that change in relationship to one another.
   * Example: Represent proportional relationships with equations like d=rt.
2. **7.NS.A.2:** Apply and extend previous understandings of multiplication and division to divide fractions and decimals.
   * Useful for solving ratio problems involving fractions.
3. **7.SP.C.8:** Find probabilities of compound events.
   * Encourages reasoning in proportional contexts like probability.

**Sequence Overview**

1. **Day 1-5:** Review foundational skills: fractions, unit rates, and dividing fractions **(5.NF.B.7, 6.NS.C.6)**.
2. **Day 6-15:** Introduce and practice 6th-grade ratio concepts **(6.RP.A.1, 6.RP.A.2).**
3. **Day 16-25:** Solve 6th-grade ratio and proportion problems **(6.RP.A.3)**.
4. **Day 26-35:** Transition to 7th-grade unit rates and proportionality **(7.RP.A.1, 7.RP.A.2.a−d).**
5. **Day 36-45:** Solve real-world ratio and percent problems **(7.RP.A.3)**.
6. **Day 46-50:** Apply supplementary standards for deeper understanding **(6.EE.C.9, 7.NS.A.2, 7.SP.C.8).**

**Cross Over Standards from 7th to 8th grade**

**1. Ratios and Proportional Relationships (7.RP) and Functions (8.F):**

* **7th Grade (7.RP):**
  + **7.RP.A.2:** Recognize and represent proportional relationships between quantities.
    - **7.RP.A.2.a:** Determine whether two quantities are in a proportional relationship.
    - **7.RP.A.2.b:** Identify the constant of proportionality (unit rate).
    - **7.RP.A.2.c:** Represent proportional relationships by equations.
    - **7.RP.A.2.d:** Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation.
* **8th Grade (8.F):**
  + **8.F.A.3:** Interpret the equation y= mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
  + **8.F.B.4:** Construct a function to model a linear relationship between two quantities.
  + **8.F.B.5:** Describe qualitatively the functional relationship between two quantities by analyzing a graph.

**2. The Number System (7.NS) and Expressions and Equations (8.EE):**

* **7th Grade (7.NS):**
  + **7.NS.A.1:** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers.
  + **7.NS.A.2:** Apply and extend previous understandings of multiplication and division to multiply and divide rational numbers.
* **8th Grade (8.EE):**
  + **8.EE.A.1:** Know and apply the properties of integer exponents to generate equivalent numerical expressions.
  + **8.EE.A.2:** Use square root and cube root symbols to represent solutions to equations.
  + **8.EE.C.7:** Solve linear equations in one variable.

**3. Expressions and Equations (7.EE and 8.EE):**

* **7th Grade (7.EE):**
  + **7.EE.B.3:** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers.
  + **7.EE.B.4:** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems.
* **8th Grade (8.EE):**
  + **8.EE.C.7:** Solve linear equations in one variable.
  + **8.EE.C.8:** Analyze and solve pairs of simultaneous linear equations.

**4. Geometry (7.G and 8.G):**

* **7th Grade (7.G):**
  + **7.G.B.6:** Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects.
* **8th Grade (8.G):**
  + **8.G.C.9:** Know the formulas for the volumes of cones, cylinders, and spheres, and use them to solve real-world and mathematical problems.

**5. Statistics and Probability (7.SP and 8.SP):**

* **7th Grade (7.SP):**
  + **7.SP.C.7:** Develop a probability model and use it to find probabilities of events.
* **8th Grade (8.SP):**
  + **8.SP.A.1:** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.
  + **8.SP.A.2:** Know that straight lines are widely used to model relationships between two quantitative variables.

**7th Grade (7.RP.A)** standards in New Mexico focus on **Ratios and Proportional Relationships**, emphasizing analyzing and solving problems using proportional reasoning. Here are the topics:

**7.RP.A.1: Compute Unit Rates Associated with Ratios of Fractions**

* Calculate unit rates in situations where the given quantities are fractions, including complex fractions.

**7.RP.A.2: Recognize and Represent Proportional Relationships Between Quantities**

**7.RP.A.2.a: Determine Proportionality**

* Identify whether two quantities are in a proportional relationship by:
  + Testing for equivalent ratios in tables.
  + Checking for linear graphs that pass through the origin.

**7.RP.A.2.b: Identify the Constant of Proportionality (Unit Rate)**

* Recognize and compute the constant k (unit rate) in proportional relationships.
  + Represent the relationship as y=kx.

**7.RP.A.2.c: Represent Proportional Relationships**

* Represent proportional relationships using:
  + Equations (e.g., y=5x).
  + Tables of equivalent ratios.
  + Graphs, ensuring they are straight lines passing through the origin.

**7.RP.A.2.d: Explain Proportional Relationships**

* Interpret and explain proportional relationships in context.
  + Example: “For every 3 apples picked, 5 pears are picked.”

**7.RP.A.3: Use Proportional Relationships to Solve Multi-Step Ratio and Percent Problems**

* Apply proportional reasoning to solve real-world and mathematical problems such as:
  + **Discounts, taxes, and tips.**
  + **Markups and markdowns.**
  + **Simple interest.**
  + **Percent increase or decrease.**
  + **Percent error.**
  + **Conversions within and between measurement systems using proportionality.**

**8.F** standards in New Mexico focus on Functions and are designed to help students understand, model, and interpret relationships between quantities. Here are the topics covered:

**8.F.A: Define, Evaluate, and Compare Functions**

1. **8.F.A.1:** Understanding Functions
   * Define a function as a rule that assigns to each input exactly one output.
   * Recognize functions expressed in various forms: tables, graphs, equations, and verbal descriptions.
   * Identify when a relationship is not a function (e.g., one input has multiple outputs).
2. **8.F.A.2:** Comparing Properties of Functions
   * Compare two functions represented in different ways (e.g., one function is represented by a graph, another by an equation or a table).
   * Example: Compare a linear function described by y=3x+2 to another represented in a graph.
3. **8.F.A.3:** Linear vs. Nonlinear Functions
   * Interpret the equation y= mx + b as defining a linear function, whose graph is a straight line.
   * Give examples of functions that are not linear, such as quadratic functions or exponential growth.

**8.F.B: Use Functions to Model Relationships Between Quantities**

1. **8.F.B.4:** Constructing and Interpreting Linear Functions
   * Construct a function to model a linear relationship between two quantities.
   * Interpret the slope (mmm) and y-intercept (b) of a linear function in the context of a problem.
   * Example: If a car travels at 60 miles per hour, model the distance d as a function of time t with d = 60t.
2. **8.F.B.5:** Describing Functional Relationships from Graphs
   * Describe qualitatively the relationship between two quantities by analyzing a graph (e.g., increasing, decreasing, linear, or nonlinear).
   * Sketch a graph based on a verbal description of a functional relationship.
   * Example: "The water level in a tank rises steadily over 2 hours, then remains constant for an hour."

**Key Focus Areas:**

* **Linear Functions:** Emphasis on recognizing, modeling, and interpreting linear relationships.
* **Function Representations:** Understanding and using different representations of functions (e.g., graphs, equations, tables, and words).
* **Real-World Applications:** Applying functions to model and interpret real-world problems.

**Crossover curriculum** that Connects **7th-grade Ratios and Proportional Relationships (7.RP)** with **8th-grade Functions (8.F)**.

**1. Review of Foundational Concepts**

Before introducing new material, review essential concepts from prior grades:

1. **6.RP.A.1:** Understand the concept of a ratio and use ratio language.
2. **6.RP.A.2:** Understand the concept of a unit rate a / b with b ≠ 0, and use rate language in context.
3. **6.RP.A.3.a:** Use tables of equivalent ratios and graph proportional relationships on a coordinate plane.
4. **6.EE.C.9:** Use variables to represent two quantities that change in relation to each other, write equations to express the relationship, and analyze graphs.

**2. Building a Foundation with Ratios and Proportions (7th Grade Standards)**

Introduce and deepen understanding of ratios and proportionality:

1. **7.RP.A.1:** Compute unit rates with ratios of fractions (e.g., miles per hour when distances are fractions).
2. **7.RP.A.2:** Analyze proportional relationships and their representations:
   * **7.RP.A.2.a:** Determine if two quantities are proportional using tables, graphs, and equations.
   * **7.RP.A.2.b:** Identify the constant of proportionality (k) in a proportional relationship.
   * **7.RP.A.2.c:** Represent proportional relationships with equations.
   * **7.RP.A.2.d:** Explain proportional relationships represented in graphs and tables.
3. **7.RP.A.3:** Solve real-world ratio and percent problems, including:
   * Discounts, taxes, and tips.
   * Percent increase or decrease.
   * Markups, markdowns, and simple interest.

**3. Transition to Functions (8th Grade Standards)**

Begin bridging proportionality to functions:

1. **8.F.A.1:** Define a function as a rule that assigns exactly one output to each input. Use graphs, tables, and equations to represent functions.
2. **8.F.A.2:** Compare properties of two functions represented in different ways (e.g., a table vs. a graph).
3. **8.F.A.3:** Distinguish between linear and nonlinear functions, including identifying y= mx+ b as linear.

**4. Applying Functions to Real-World Problems (8th Grade Standards)**

Explore linear functions and deepen understanding:

1. **8.F.B.4:** Construct a linear function to model relationships between two quantities. Interpret the slope (m) and y-intercept (b) in context.
   * Example: If a car travels at 60 mph, represent distance as d = 60t.
2. **8.F.B.5:** Describe qualitative relationships from graphs, such as increasing, decreasing, linear, or nonlinear behavior.

**5. Supplementary Standards for Enrichment**

1. **7.EE.B.4.a:** Solve problems using equations in the form px + q= r and p(x+q) = r (helps transition to linear functions).
2. **8.EE.B.5:** Graph proportional relationships and interpret the unit rate as the slope of the graph.
3. **8.EE.C.7:** Solve linear equations in one variable, including those with rational coefficients.
4. **8.SP.A.1:** Create scatter plots and analyze relationships between two quantities (e.g., correlation and trends).

**Sequence Overview**

**Week 1: Review Foundational Concepts**

* Introduce ratios, unit rates, and proportionality.
* Use tables, graphs, and simple equations to analyze relationships.

**Week 2-3: 7th Grade Standards (7.RP)**

* Analyze proportional relationships, identify constants of proportionality, and represent them with equations and graphs.
* Solve multi-step real-world problems involving ratios and percentages.

**Week 4-5: Transition to Functions (8.F.A)**

* Define functions and compare their properties.
* Introduce the concept of linear functions and distinguish them from nonlinear functions.

**Week 6-7: Applying Functions (8.F.B)**

* Construct and interpret linear functions.
* Explore slope and y-intercept in real-world contexts.
* Analyze graphs for qualitative relationships.

**Week 8: Enrichment and Application**

* Solve more complex linear equations and graph proportional relationships with slopes.
* Introduce scatter plots and analyze trends in bivariate data.

**Key Connections Between 7.RP and 8.F**

* **Proportionality to Functions:** Build understanding that proportional relationships (y = kx) are a subset of linear functions (y = mx + b).
* **Graphs and Slope:** Reinforce the idea that the constant of proportionality (k) in 7th grade becomes the slope (m) in 8th grade.
* **Real-World Contexts:** Use real-world problems (e.g., speed, pricing, scaling) to illustrate both proportional and functional relationships.

In New Mexico's **Algebra I** curriculum, the concepts of **ratios and proportions** are integrated within various standards, particularly in the study of functions and equations. While the explicit focus on ratios and proportional relationships is emphasized in earlier grades, Algebra I builds upon this foundation to explore more complex applications. Key standards that encompass these concepts include:

**1. Interpreting Functions (F-IF):**

* **F-IF.6:** Calculate and interpret the average rate of change of a function over a specified interval. This involves understanding how quantities change proportionally over time or within given contexts.

**2. Building Functions (F-BF):**

* **F-BF.1:** Write functions that describe relationships between quantities. This standard extends the idea of proportional relationships to more general functions, including linear and exponential models.

**3. Linear, Quadratic, and Exponential Models (F-LE):**

* **F-LE.1:** Distinguish between situations that can be modeled with linear functions and those with exponential functions. This requires an understanding of constant rates of change (proportional relationships) versus varying rates of change.

**4. Reasoning with Equations and Inequalities (A-REI):**

* **A-REI.3:** Solve linear equations and inequalities in one variable, including those involving absolute value. This involves applying proportional reasoning to find solutions.
* **A-REI.5:** Prove that, given a system of two linear 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. This utilizes proportional reasoning in the context of systems of equations.

In New Mexico's **6th-grade** mathematics curriculum, the **Expressions and Equations (6.EE)** domain comprises the following clusters and standards:

**1. Apply and Extend Previous Understandings of Arithmetic to Algebraic Expressions**

**6.EE.A.1**: Write and evaluate numerical expressions involving whole-number exponents.

**6.EE.A.2**: Write, read, and evaluate expressions in which letters stand for numbers.

**6.EE.A.2a**: Write expressions that record operations with numbers and with letters standing for numbers.

**6.EE.A.2b**: Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.

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

**6.EE.A.3**: Apply the properties of operations to generate equivalent expressions.

**6.EE.A.4**: Identify when two expressions are equivalent.

**2. Reason About and Solve One-Variable Equations and Inequalities**

* **6.EE.B.5**: Understand solving an equation or inequality as a process of determining which values from a specified set make the equation or inequality true. Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
* **6.EE.B.6**: Use variables to represent numbers and write expressions when solving real-world or mathematical problems; understand that a variable can represent an unknown number or any number in a specified set.
* **6.EE.B.7**: 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.
* **6.EE.B.8**: Write an inequality of the form *x* > *c* or *x* < *c* to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of this form have infinitely many solutions; represent solutions on number line diagrams.

**3. Represent and Analyze Quantitative Relationships Between Dependent and Independent Variables**

* **6.EE.C.9**: Use variables to represent two quantities that change in relationship to one another in real-world problems. Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, the independent variable. Analyze the relationship between dependent and independent variables using graphs and tables and relate these to the corresponding equations.

In New Mexico's **7th-grade** mathematics curriculum, the **Expressions and Equations (7.EE)** domain encompasses the following clusters and standards:

**1. Use Properties of Operations to Generate Equivalent Expressions**

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

**7.EE.A.2**: Understand 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.

**2. Solve Real-Life and Mathematical Problems Using Numerical and Algebraic Expressions and Equations**

**7.EE.B.3**: 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. 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.

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

* + **7.EE.B.4.a**: 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. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
  + **7.EE.B.4.b**: 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. Graph the solution set of the inequality and interpret it in the context of the problem.

Creating a **crossover curriculum** between **6.EE** and **7.EE** **Expressions and Equations** can help bridge gaps in understanding and build a seamless transition between 6th and 7th-grade mathematical concepts.

**Unit 1: Foundations of Algebraic Thinking**

**Objective: Build a strong base in algebraic operations and expressions by connecting concepts from 6th and 7th grade.**

* **Review Standards**:
  + **5.OA.A.1**: Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
  + **5.NBT.B.7**: Perform operations with multi-digit decimals.
* **6th Grade Standards (6.EE)**:
  + **6.EE.A.1**: Write and evaluate numerical expressions involving whole-number exponents.
  + **6.EE.A.2**: Write, read, and evaluate expressions where letters stand for numbers.
  + **6.EE.A.3**: Apply properties of operations to generate equivalent expressions.
* **7th Grade Standards (7.EE)**:
  + **7.EE.A.1**: Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
  + **7.EE.A.2**: Understand rewriting expressions in different forms.
* **Supplementary Standards**:
  + Reinforce understanding of **Order of Operations** and the **Distributive Property**.

**Unit 2: Solving Equations and Inequalities**

**Objective: Develop problem-solving skills for linear equations and inequalities.**

* **Review Standards**:
  + **6.EE.A.2c**: Evaluate expressions for specific values of variables.
* **6th Grade Standards (6.EE)**:
  + **6.EE.B.5**: Solve equations by determining which values make them true.
  + **6.EE.B.7**: Solve one-step linear equations (*x* + *p* = *q*, *px* = *q*).
  + **6.EE.B.8**: Represent solutions to inequalities on number lines.
* **7th Grade Standards (7.EE)**:
  + **7.EE.B.4.a**: Solve equations of the form *px* + *q* = *r* and compare algebraic and arithmetic solutions.
  + **7.EE.B.4.b**: Solve inequalities of the form *px* + *q* > *r* or *px* + *q* < *r* and graph the solution.
* **Supplementary Standards**:
  + Reason about **inequalities** and their applications in real-world contexts.

**Unit 3: Quantitative Relationships**

**Objective: Analyze relationships between variables and understand dependent and independent variables.**

* **Review Standards**:
  + **6.RP.A.3a**: Understand ratio concepts to relate dependent and independent variables.
* **6th Grade Standards (6.EE)**:
  + **6.EE.C.9**: Use variables to represent changing quantities, and analyze relationships using graphs, tables, and equations.
* **7th Grade Standards (7.EE)**:
  + **7.EE.B.3**: Solve multi-step real-life and mathematical problems with rational numbers.
* **Supplementary Standards**:
  + Build connections with proportional reasoning from **6.RP** and **7.RP**.

**Unit 4: Extending and Applying Algebra**

**Objective: Explore applications of algebraic concepts in more advanced contexts.**

* **Review Standards**:
  + Reinforce **6.EE.A.3**: Apply properties of operations to generate equivalent expressions.
* **7th Grade Standards (7.EE)**:
  + **7.EE.B.4**: Use variables and equations to solve real-world problems.
* **Supplementary Standards**:
  + Introduce simple **systems of equations** using substitution or graphing to prepare for 8th-grade standards.

**Sequence of Units**

1. **Foundations of Algebraic Thinking (4 Weeks)**:
   * Review basic operations, numerical expressions, and algebraic properties.
   * Build a strong base in understanding and simplifying algebraic expressions.
2. **Solving Equations and Inequalities (8 Weeks)**:
   * Transition from solving simple equations to multi-step equations and inequalities.
   * Emphasize graphing and real-world applications.
3. **Quantitative Relationships (6 Weeks)**:
   * Focus on relationships between dependent and independent variables.
   * Analyze these relationships through tables, graphs, and equations.
4. **Extending and Applying Algebra (6 Weeks)**:
   * Solve more complex equations and inequalities.
   * Introduce simple systems of equations to prepare for 8th-grade content.
5. **Assessment and Enrichment (6 Weeks)**:
   * Consolidate learning through cumulative review, project-based learning, and enrichment activities.

**Connection Section**

The curriculum is designed to align **6th-grade concepts** (6.EE) with **7th-grade extensions** (7.EE), ensuring a seamless transition between grades. Below is an explanation of how each section connects concepts:

**1. Bridging Arithmetic and Algebra**

* **Connection**: Students progress from evaluating numerical expressions (6.EE.A.1) to simplifying and factoring expressions with rational coefficients (7.EE.A.1).
* **Purpose**: Reinforces the **Order of Operations** and **properties of operations**, emphasizing their use in algebraic contexts.

**2. From One-Step to Multi-Step Equations**

* **Connection**: Students start with solving one-step equations (6.EE.B.7) and advance to solving multi-step equations (7.EE.B.4a).
* **Purpose**: Strengthens problem-solving skills by gradually increasing complexity and integrating real-world scenarios.

**3. Understanding Variables and Relationships**

* **Connection**: Students learn to use variables to represent relationships (6.EE.C.9) and deepen this understanding by solving problems involving dependent and independent variables (7.EE.B.3).
* **Purpose**: Prepares students for proportional reasoning and introduces algebraic modeling, which connects directly to functions in later grades.

**4. Real-World Applications**

* **Connection**: Inequalities are introduced with simple representations and number lines (6.EE.B.8) and expanded to graphing solutions in real-world contexts (7.EE.B.4b).
* **Purpose**: Demonstrates the practical use of algebra, making it relevant and engaging for students.

**5. Preparing for Advanced Algebra**

* **Connection**: Generating equivalent expressions (6.EE.A.3) lays the groundwork for manipulating and solving systems of equations (introduced in 7.EE and expanded in 8th grade).
* **Purpose**: Builds algebraic fluency, ensuring students are ready for more advanced concepts like quadratic equations and functions.

**Key Themes Across Units**

1. **Progressive Complexity**: Each unit builds on prior knowledge, gradually increasing in difficulty to ensure mastery before advancing.
2. **Integration of Standards**: Aligns closely with the New Mexico math standards for 6th and 7th grades, ensuring coverage of critical content.
3. **Real-World Relevance**: Provides meaningful contexts for mathematical concepts, reinforcing their applicability.
4. **Preparation for the Future**: Aligns 7th-grade standards with key concepts needed for 8th-grade algebra and beyond.

In New Mexico's **7th-grade** mathematics curriculum, the **Expressions and Equations (7.EE)** domain encompasses the following clusters and standards:

**1. Use Properties of Operations to Generate Equivalent Expressions**

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

**7.EE.A.2**: Understand 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.

**2. Solve Real-Life and Mathematical Problems Using Numerical and Algebraic Expressions and Equations**

**7.EE.B.3**: 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. 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.

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

**7.EE.B.4.a**: 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. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

**7.EE.B.4.b**: 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. Graph the solution set of the inequality and interpret it in the context of the problem.

In the **8th-grade** mathematics curriculum, the **Expressions and Equations (8.EE)** domain encompasses three primary clusters, each detailing specific standards:

**1. Work with Radicals and Integer Exponents**

**8.EE.A.1**: Know and apply the properties of integer exponents to generate equivalent numerical expressions.

**8.EE.A.2**: Use square root and cube root symbols to represent solutions to equations of the form *x*² = *p* and *x*³ = *p*, where *p* is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Recognize that √2 is irrational.

**8.EE.A.3**: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities and to express how many times as much one is than the other.

**8.EE.A.4**: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.

**2. Understand the Connections Between Proportional Relationships, Lines, and Linear Equations**

**8.EE.B.5**: Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

**8.EE.B.6**: Use similar triangles to explain why the slope (*m*) is the same between any two distinct points on a non-vertical line in the coordinate plane; 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*.

**3. Analyze and Solve Linear Equations and Pairs of Simultaneous Linear Equations**

**8.EE.C.7**: Solve linear equations in one variable.

* + **8.EE.C.7.a**: 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.
  + **8.EE.C.7.b**: Solve linear equations with rational number coefficients, including equations requiring expanding expressions using the distributive property and collecting like terms.

**8.EE.C.8**: Analyze and solve pairs of simultaneous linear equations.

* + **8.EE.C.8.a**: Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs.
  + **8.EE.C.8.b**: Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.
  + **8.EE.C.8.c**: Solve real-world and mathematical problems leading to two linear equations in two variables.

This curriculum bridges **7th-grade Expressions and Equations (7.EE)** and **8th-grade Expressions and Equations (8.EE)**, focusing on strengthening algebraic understanding and ensuring a smooth transition between grades.

**Unit 1: Foundations of Algebraic Expressions**

**Objective: Build fluency in simplifying, expanding, and factoring expressions, including applying properties of exponents.**

**Review Standards**:

* + **6.EE.A.1**: Write and evaluate numerical expressions involving whole-number exponents.
  + **6.EE.A.3**: Apply properties of operations to generate equivalent expressions.
  + **7.EE.A.1**: Add, subtract, factor, and expand linear expressions with rational coefficients.
  + **7.EE.A.2**: Rewrite expressions to shed light on problem contexts and quantities.

**7th Grade Standards**:

* + **7.EE.A.1** (continued): Extend factoring and expansion to include more complex expressions with rational coefficients.

**8th Grade Standards**:

* + **8.EE.A.1**: Know and apply properties of integer exponents to generate equivalent numerical expressions.

**Supplementary Standards**:

* + Reinforce the **Order of Operations** with rational numbers.
  + Provide additional practice with exponents, including negative and zero exponents.

**Unit 2: Solving Equations and Inequalities**

**Objective: Develop proficiency in solving linear equations and inequalities, progressing to more complex equations.**

**Review Standards**:

**7.EE.B.3**: Solve multi-step problems posed with rational numbers in any form.

* + **7.EE.B.4**: Use variables to represent quantities in problems and solve simple equations and inequalities.

**7.EE.B.4.a**: Solve word problems leading to equations of the form *px* + *q* = *r*.

**7.EE.B.4.b**: Solve word problems leading to inequalities and graph the solutions.

**7th Grade Standards**:

**7.EE.B.4.a** (continued): Extend to equations with fractional coefficients.

**7.EE.B.4.b** (continued): Work on graphing solutions to inequalities in real-world contexts.

**8th Grade Standards**:

**8.EE.C.7**: Solve linear equations in one variable.

**8.EE.C.7.a**: Explore cases with one solution, infinitely many solutions, or no solution.

**8.EE.C.7.b**: Solve linear equations with rational coefficients, using the distributive property and combining like terms.

**Supplementary Standards**:

* + Incorporate word problems involving multi-variable equations to prepare for systems of equations in later units.

**Unit 3: Proportional Relationships and Slope**

**Objective: Connect proportional reasoning to linear equations and slope.**

**Review Standards**:

**6.RP.A.3**: Use ratio reasoning to solve problems.

**7.RP.A.2**: Recognize proportional relationships and use them to solve problems.

**7th Grade Standards**:

**7.EE.B.5**: Graph proportional relationships, interpreting the unit rate as slope.

**8th Grade Standards**:

**8.EE.B.5**: Graph proportional relationships and compare two different proportional relationships represented in different ways.

**8.EE.B.6**: Use similar triangles to explain the consistency of slope and derive the equation *y* = *mx* + *b*.

**Supplementary Standards**:

Explore real-world examples of proportional relationships (e.g., speed, density).

**Unit 4: Scientific Notation and Real-World Quantities**

**Objective: Perform operations with scientific notation and interpret very large and small quantities.**

**Review Standards**:

**7.EE.B.3**: Solve problems with rational numbers in various forms.

**7.EE.B.4**: Use variables to represent real-world quantities.

**8th Grade Standards**:

**8.EE.A.3**: Use scientific notation to estimate and compare very large or small quantities.

**8.EE.A.4**: Perform operations with numbers in scientific notation and interpret scientific notation generated by technology.

**Supplementary Standards**:

Connect scientific notation to real-world contexts (e.g., astronomy, biology, engineering).

**Unit 5: Systems of Linear Equations**

**Objective: Introduce and solve systems of linear equations graphically and algebraically.**

**Review Standards**:

**7.EE.B.4**: Solve equations and inequalities in one variable.

**8th Grade Standards**:

**8.EE.C.8**: Analyze and solve pairs of simultaneous linear equations.

**8.EE.C.8.a**: Understand solutions correspond to points of intersection.

**8.EE.C.8.b**: Solve systems algebraically and estimate graphically.

**8.EE.C.8.c**: Solve real-world problems involving systems of equations.

**Supplementary Standards**:

Extend to real-world systems, such as budgeting and optimization problems.

**Sequence Overview**

1. **Foundations of Algebraic Expressions**: Focus on building fluency in operations, properties of exponents, and equivalent expressions.
2. **Solving Equations and Inequalities**: Gradually increase complexity from one-step to multi-step equations and inequalities, including equations with fractional coefficients.
3. **Proportional Relationships and Slope**: Establish connections between proportional reasoning, linear equations, and slope, paving the way for systems of equations.
4. **Scientific Notation and Real-World Quantities**: Use scientific notation to analyze and solve problems involving very large and small quantities.
5. **Systems of Linear Equations**: Introduce systems of equations as a culmination of linear reasoning and problem-solving.

**Connection Section**

**1. Building from Previous Knowledge**

**6th Grade Connections**: Students extend their understanding of expressions, equations, and proportional relationships introduced in 6.EE and 6.RP.

**7th Grade Foundation**: Builds directly on multi-step problem-solving, proportional reasoning, and understanding of slope and inequalities in 7.EE and 7.RP.

**2. Emphasis on Real-World Applications**

Connections to real-life problems (e.g., graphing data, interpreting trends, and solving equations for unknown quantities) help solidify the relevance of algebraic reasoning.

**3. Bridging to Advanced Algebra**

Prepares students for high school algebra by introducing concepts like slope-intercept form, systems of equations, and scientific notation.

Reinforces logical reasoning skills needed for solving quadratic equations and working with functions.

**Crossover standards for 8th grade math and Algebra I**

**1. Expressions and Equations (8.EE) and Algebra (A):**

* **8th Grade (8.EE):**
  + **8.EE.C.7:** Solve linear equations in one variable, including those with rational coefficients.
  + **8.EE.C.8:** Analyze and solve pairs of simultaneous linear equations.
* **Algebra I (A-REI):**
  + **A-REI.3:** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
  + **A-REI.5:** Prove that, given a system of two linear 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.
  + **A-REI.6:** Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

**2. Functions (8.F) and Functions (F):**

* **8th Grade (8.F):**
  + **8.F.A.1:** Understand that a function is a rule that assigns to each input exactly one output.
  + **8.F.A.3:** Interpret the equation y = mx + b as defining a linear function.
* **Algebra I (F-IF):**
  + **F-IF.1:** Understand that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range.
  + **F-IF.7:** Graph functions expressed symbolically and show key features of the graph, with emphasis on linear and exponential functions.

**3. Geometry (8.G) and Geometry (G):**

* **8th Grade (8.G):**
  + **8.G.B.6:** Explain a proof of the Pythagorean Theorem and its converse.
  + **8.G.C.9:** Apply the formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems.
* **Algebra I (G-GPE):**
  + **G-GPE.7:** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

**4. Statistics and Probability (8.SP) and Statistics and Probability (S):**

* **8th Grade (8.SP):**
  + **8.SP.A.1:** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.
  + **8.SP.A.2:** Know that straight lines are widely used to model relationships between two quantitative variables.
* **Algebra I (S-ID):**
  + **S-ID.6:** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
  + **S-ID.7:** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

The **Expressions and Equations (8.EE)** domain in the New Mexico 8th Grade Mathematics Standards focuses on developing students' skills in manipulating equations, understanding proportional relationships, and working with exponents. Here are the topics and associated standards:

**1. Working with Exponents**

**8.EE.A.1:**

* + Apply properties of integer exponents to generate equivalent expressions.

**8.EE.A.2:**

* + Use square root and cube root symbols to represent solutions to equations.
  + Understand that square roots of non-perfect squares are irrational.

**2. Scientific Notation**

* **8.EE.A.3:**
  + Use scientific notation to express very large or very small quantities
  + Compare numbers written in scientific notation.
* **8.EE.A.4:**
  + Perform operations with numbers in scientific notation.
  + Use scientific notation to interpret real-world problems, such as distances in astronomy.

**3. Proportional Relationships and Linear Equations**

* **8.EE.B.5:**
  + Graph proportional relationships, interpreting the unit rate as the slope of the graph.
  + Example: A graph showing a car traveling at 60 mph would have a slope of 60.
* **8.EE.B.6:**
  + Use similar triangles to explain why the slope of a line is the same between any two points.
  + Derive the equation of a line y = mx + b from the relationship between two variables.

**4. Solving Linear Equations and Systems**

**8.EE.C.7:**

* + Solve linear equations in one variable, including:
    - Equations with rational coefficients.
    - Equations requiring the distributive property and combining like terms.

**8.EE.C.8:**

* + Analyze and solve systems of two linear equations.
  + Example:
    - Solve by graphing or substitution.
    - Interpret solutions to systems of equations in real-world contexts.

**Key Themes Across 8.EE**

1. **Understanding Structure:** Focus on recognizing and manipulating the structure of expressions and equations.
2. **Real-World Applications:** Use these skills to solve practical problems, such as calculating speed, interpreting graphs, or working with scientific data.
3. **Connecting Concepts:** Build connections between proportional relationships, slope, and the equations of lines.

**Algebra I** curriculum, the **Expressions and Equations** domain encompasses several key areas that are vital for students' understanding of algebraic concepts. These areas include interpreting and manipulating expressions, performing arithmetic operations on polynomials, creating equations, and reasoning with equations and inequalities. Below is an overview of the relevant standards and their associated topics:

**1. Seeing Structure in Expressions (A-SSE)**

**Interpret the Structure of Expressions:**

* + **A-SSE.A.1:** Interpret expressions that represent a quantity in terms of its context.
    - **A-SSE.A.1a:** Interpret parts of an expression, such as terms, factors, and coefficients.
    - **A-SSE.A.1b:** Interpret complicated expressions by viewing one or more of their parts as a single entity.
  + **A-SSE.A.2:** Use the structure of an expression to identify ways to rewrite it.

**Write Expressions in Equivalent Forms to Solve Problems:**

* + **A-SSE.B.3:** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
    - **A-SSE.B.3a:** Factor a quadratic expression to reveal the zeros of the function it defines.
    - **A-SSE.B.3b:** Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
    - **A-SSE.B.3c:** Use the properties of exponents to transform expressions for exponential functions.

**2. Arithmetic with Polynomials and Rational Expressions (A-APR)**

* **Perform Arithmetic Operations on Polynomials:**
  + **A-APR.A.1:** Understand that polynomials form a system analogous to the integers; they are closed under addition, subtraction, and multiplication.
    - Add, subtract, and multiply polynomials.

**3. Creating Equations (A-CED)**

* **Create Equations That Describe Numbers or Relationships:**
  + **A-CED.A.1:** Create equations and inequalities in one variable and use them to solve problems.
    - Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
  + **A-CED.A.2:** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with appropriate labels and scales.
  + **A-CED.A.3:** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
  + **A-CED.A.4:** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

**4. Reasoning with Equations and Inequalities (A-REI)**

* **Understand Solving Equations as a Process of Reasoning and Explain the Reasoning:**
  + **A-REI.A.1:** Explain each step in solving a simple equation as follows from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution.
    - Construct a viable argument to justify a solution method.
* **Solve Equations and Inequalities in One Variable:**
  + **A-REI.B.3:** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
* **Solve Systems of Equations:**
  + **A-REI.C.5:** Prove that, given a system of two linear 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.
  + **A-REI.C.6:** Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
* **Represent and Solve Equations and Inequalities Graphically:**
  + **A-REI.D.10:** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.
  + **A-REI.D.11:** Explain why the x-coordinates of the points where the graphs of the equations intersect are the solutions of the equation; find the solutions approximately.
  + **A-REI.D.12:** 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.

**Crossover curriculum connecting 8th Grade Expressions and Equations (8.EE) with Algebra I Expressions and Equations (A).**

**1. Review of Foundational Concepts**

Before starting the curriculum, review prior knowledge:

1. **7.EE.B.3:** Solve multi-step real-world problems involving rational numbers and equations.
2. **7.RP.A.2:** Analyze proportional relationships and represent them with equations and graphs.
3. **7.NS.A.2:** Apply multiplication and division of integers and fractions.

**2. Introduction to Exponents (8th Grade Standards)**

**Topic:** Working with integer exponents and their properties.

1. **8.EE.A.1:** Apply properties of integer exponents to generate equivalent expressions
2. **8.EE.A.2:** Evaluate square roots and cube roots and understand that non-perfect squares and cubes are irrational.

**3. Transition to Algebra I Exponent Concepts**

**Topic:** Extending exponent rules to polynomial expressions and rational exponents.

1. **A-SSE.A.1:** Interpret expressions and understand parts of an expression, including terms and coefficients.
2. **A-SSE.B.3c:** Use properties of exponents to rewrite expressions for exponential functions.

**4. Scientific Notation and Real-World Applications**

**Topic:** Understanding and using scientific notation.

1. **8.EE.A.3:** Use scientific notation to express large or small numbers and compare quantities.
2. **8.EE.A.4:** Perform operations with numbers in scientific notation in real-world contexts (e.g., astronomy, biology).

**5. Linear Equations and Proportional Relationships**

**Topic:** Building a foundation for linear equations and systems.

1. **8.EE.B.5:** Graph proportional relationships, interpreting unit rate as the slope of the graph.
2. **8.EE.B.6:** Derive the equation of a line y = mx + b using similar triangles.

**Algebra I Extension:**

3. **A-REI.D.10:** Understand that the graph of an equation in two variables represents its solutions.

4. **A-CED.A.2:** Create equations in two or more variables and graph them with appropriate labels and

scales.

**6. Solving Linear Equations**

**Topic:** Solving single-variable linear equations.

1. **8.EE.C.7:** Solve linear equations in one variable, including equations requiring the distributive property and combining like terms.
2. **A-REI.B.3:** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

**7. Systems of Linear Equations**

**Topic:** Analyzing and solving systems of equations.

1. **8.EE.C.8:** Solve systems of two linear equations graphically and algebraically.
2. **A-REI.C.5:** Prove that replacing one equation in a system with the sum of that equation and a multiple of the other produces an equivalent system.
3. **A-REI.C.6:** Solve systems of equations exactly and approximately using substitution or elimination.

**8. Polynomial Expressions**

**Topic:** Performing operations on polynomials (extension of 8th-grade exponent work).

1. **A-APR.A.1:** Add, subtract, and multiply polynomials, understanding they form a closed system under these operations.
2. **A-SSE.A.2:** Use the structure of an expression to identify ways to rewrite it (e.g., factoring quadratics).

**9. Supplementary Topics**

1. **A-CED.A.4:** Rearrange formulas to highlight a specific variable, applying reasoning from solving equations (e.g., V=IRV = IRV=IR).
2. **A-SSE.B.3a:** Factor quadratic expressions to reveal their zeros, building toward solving quadratic equations.
3. **A-REI.D.12:** Graph solutions to systems of inequalities as intersections of half-planes.

**Sequence Overview**

**Week 1-2: Review foundational topics.**

* Focus on proportional relationships, rational numbers, and basic equation solving.

**Week 3-4: Exponents and scientific notation.**

* Introduce integer exponent rules and scientific notation.
* Transition to rewriting exponential expressions in Algebra I.

**Week 5-6: Linear equations and proportional relationships.**

* Explore graphing lines, slope, and linear relationships.

**Week 7-8: Solving linear equations and systems.**

* Practice solving single-variable equations and systems of equations.

**Week 9-10: Polynomial expressions and supplementary topics.**

* Introduce operations with polynomials and extend to factoring.

**Key Connections**

* **Proportional Relationships to Linear Functions:** Use 8th-grade concepts of slope and rate to transition into linear functions in Algebra I.
* **Exponent Rules:** Build from integer exponents in 8th grade to exponential functions and polynomial operations in Algebra I.
* **Systems of Equations:** Transition from graphing systems in 8th grade to solving them algebraically in Algebra I.

In the **6th-grade** mathematics curriculum, the **Number System (6.NS)** domain encompasses three primary clusters, each detailing specific standards:

**1. Apply and Extend Previous Understandings of Multiplication and Division to Divide Fractions by Fractions**

**6.NS.A.1**: Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, using visual fraction models and equations to represent the problem.

**2. Compute Fluently with Multi-Digit Numbers and Find Common Factors and Multiples**

**6.NS.B.2**: Fluently divide multi-digit numbers using the standard algorithm.

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

**6.NS.B.4**: Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers with a common factor as a multiple of a sum of two whole numbers with no common factor.

**3. Apply and Extend Previous Understandings of Numbers to the System of Rational Numbers**

**6.NS.C.5**: Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

**6.NS.C.6**: Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates.

**6.NS.C.6.a**: Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself.

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

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

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

**6.NS.C.7.a**: Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.

**6.NS.C.7.b**: Write, interpret, and explain statements of order for rational numbers in real-world contexts.

**6.NS.C.7.c**: Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.

**6.NS.C.7.d**: Distinguish comparisons of absolute value from statements about order.

**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.

These standards collectively aim to enhance students' understanding and proficiency with the number system, including operations with fractions, multi-digit numbers, and the extension of number concepts to include negative numbers and the coordinate plane.

In the **7th-grade** mathematics curriculum, the **Number System (7.NS)** domain focuses on extending students' understanding of operations with fractions to include all rational numbers. This domain comprises one primary cluster with specific standards:

**Apply and Extend Previous Understandings of Operations with Fractions to Add, Subtract, Multiply, and Divide Rational Numbers**

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

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

**7.NS.A.1.b**: Understand *p* + *q* as the number located a distance |*q*| from *p*, in the positive or negative direction depending on whether *q* is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

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

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

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

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

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

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

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

**7.NS.A.3**: Solve real-world and mathematical problems involving the four operations with rational numbers.

These standards aim to deepen students' understanding of rational numbers and their operations, enabling them to solve complex mathematical and real-world problems involving addition, subtraction, multiplication, and division of rational numbers.

This crossover curriculum bridges **6.NS (6th Grade Number System)** and **7.NS (7th Grade Number System)**, ensuring a strong foundation in rational numbers and operations while preparing students for advanced applications in real-world contexts.

**Unit 1: Introduction to Rational Numbers**

**Objective: Establish a clear understanding of positive and negative numbers, absolute value, and basic operations with fractions and decimals.**

**Review Standards**:

**5.NBT.B.7**: Add, subtract, multiply, and divide decimals to hundredths.

**5.NF.B.7**: Divide unit fractions by whole numbers and whole numbers by unit fractions.

**6th Grade Standards (6.NS)**:

**6.NS.C.5**: Understand positive and negative numbers used together to describe quantities with opposite directions or values.

**6.NS.C.6**: Understand a rational number as a point on the number line.

**6.NS.C.6.a**: Recognize opposite signs of numbers as indicating opposite locations.

**6.NS.C.6.c**: Find and position integers and rational numbers on a number line.

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

**6.NS.C.7.c**: Interpret absolute value as magnitude for positive and negative quantities.

**7th Grade Standards (7.NS)**:

**7.NS.A.1**: Apply and extend previous understandings of addition and subtraction to rational numbers.

* + - **7.NS.A.1.a**: Describe situations where opposite quantities combine to make 0.
    - **7.NS.A.1.c**: Understand subtraction as adding the additive inverse.

**Supplementary Standards**:

Practice graphing rational numbers on a coordinate plane.

Include additional word problems involving distances and absolute values.

**Unit 2: Operations with Rational Numbers**

**Objective: Extend arithmetic operations to include all rational numbers, focusing on multi-step problems and real-world contexts.**

**Review Standards**:

**6.NS.A.1**: Interpret and compute quotients of fractions, including dividing fractions by fractions.

**6th Grade Standards (6.NS)**:

**6.NS.B.2**: Fluently divide multi-digit numbers using the standard algorithm.

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

**6.NS.B.4**: Find the greatest common factor (GCF) and least common multiple (LCM) of two numbers.

**7th Grade Standards (7.NS)**:

**7.NS.A.2**: Apply and extend understandings of multiplication and division to rational numbers.

**7.NS.A.2.a**: Understand multiplication of rational numbers, including rules for signs.

**7.NS.A.2.b**: Understand division of rational numbers and interpret quotients in real-world contexts.

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

**Supplementary Standards**:

Solve problems involving fractions and decimals in science and financial contexts.

Explore real-world applications of GCF and LCM (e.g., scheduling, packaging).

**Unit 3: Real-World Applications of Rational Numbers**

**Objective: Apply operations with rational numbers to solve mathematical and real-world problems.**

**Review Standards**:

**6.NS.C.8**: Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane.

**7th Grade Standards (7.NS)**:

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

**7.NS.A.3**: Solve real-world and mathematical problems involving the four operations with rational numbers.

**Supplementary Standards**:

Include problems involving temperature changes, elevation, and financial gains/losses.

Extend to simple problems involving ratios and proportions for real-world contexts.

**Sequence Overview**

1. **Introduction to Rational Numbers (5 Weeks)**:

Focus on understanding rational numbers, their placement on the number line, and absolute value.

Introduce basic addition and subtraction of integers and rational numbers.

1. **Operations with Rational Numbers (6 Weeks)**:

Extend arithmetic operations to include all rational numbers (fractions, decimals, and integers).

Emphasize multiplication and division of signed numbers with real-world applications.

1. **Real-World Applications of Rational Numbers (5 Weeks)**:

Solve complex multi-step problems involving all four operations with rational numbers.

Explore practical scenarios like budgeting, measurements, and scientific contexts.

1. **Assessment and Cumulative Review (2 Weeks)**:

Summative assessments covering all standards.

Include cumulative projects that integrate multiple concepts.

This curriculum bridges **7th and 8th-grade Number System & Expressions and Equations**, focusing on operations with rational numbers, integer exponents, square/cube roots, and solving linear equations. It ensures students build a robust understanding and connection across these critical topics.

**Unit 1: Understanding and Operating with Rational Numbers**

**Objective: Strengthen operations with rational numbers (positive and negative) to prepare for algebraic contexts.**

**Review Standards**:

**6.NS.C.5**: Understand positive and negative numbers in real-world contexts.

**6.NS.C.6**: Represent rational numbers on a number line.

**6.NS.A.1**: Interpret and compute quotients of fractions, including dividing fractions by fractions.

**7th Grade Standards**:

**7.NS.A.1**: Apply and extend understanding of addition and subtraction to rational numbers.

* + - **7.NS.A.1.a**: Combine opposite quantities to make 0.
    - **7.NS.A.1.c**: Understand subtraction as adding the additive inverse.
    - **7.NS.A.1.d**: Apply properties of operations to add and subtract rational numbers.

**7.NS.A.2**: Apply understanding of multiplication and division to rational numbers.

* + - **7.NS.A.2.a**: Extend multiplication to rational numbers, interpreting products in real-world contexts.
    - **7.NS.A.2.b**: Understand division of rational numbers and interpret quotients.
    - **7.NS.A.2.c**: Apply properties of operations to multiply and divide rational numbers.

**Supplementary Standards**:

* + Include real-world problems (e.g., temperature changes, financial gains/losses).
  + Explore visual representations of rational operations on number lines.

**Unit 2: Properties of Integer Exponents**

**Objective: Develop fluency in the application of integer exponents and their properties.**

**Review Standards**:

**6.EE.A.1**: Write and evaluate numerical expressions involving whole-number exponents.

**8th Grade Standards**:

**8.EE.A.1**: Apply properties of integer exponents to generate equivalent numerical expressions.

**Supplementary Standards**:

* + Include problems with negative and zero exponents.

Extend to real-world applications (e.g., scientific notation for large/small quantities).

**Unit 3: Square Roots, Cube Roots, and Rational/Irrational Numbers**

**Objective: Understand square roots, cube roots, and the nature of rational and irrational numbers.**

**Review Standards**:

* + **7.NS.A.2.d**: Convert rational numbers to decimals using long division; identify terminating or repeating decimals.

**8th Grade Standards**:

* + **8.EE.A.2**: Use square and cube root symbols to represent solutions to equations like *x² = p* and *x³ = p*. Evaluate small perfect squares and cubes; recognize √2 as irrational.

**Supplementary Standards**:

* + Extend to real-world applications, such as geometry problems involving area and volume.
  + Compare and contrast rational and irrational numbers in real-world contexts.

**Unit 4: Solving Linear Equations**

**Objective: Solve linear equations and understand the nature of their solutions.**

**Review Standards**:

* + **7.NS.A.1.d**: Use properties of operations to solve equations with rational numbers.

**8th Grade Standards**:

* + **8.EE.C.7**: Solve linear equations in one variable.
    - **8.EE.C.7.a**: Identify cases of one solution, infinitely many solutions, or no solution.
    - **8.EE.C.7.b**: Solve linear equations with rational coefficients, including equations requiring distributive property and combining like terms.

**Supplementary Standards**:

* + Explore real-world linear equations (e.g., budgeting, physics problems).
  + Introduce simple systems of linear equations as an extension for advanced students.

**Sequence Overview**

1. **Unit 1: Understanding and Operating with Rational Numbers (5 Weeks)**:

Build fluency in operations with rational numbers, emphasizing addition, subtraction, multiplication, and division.

Explore real-world contexts to deepen understanding.

1. **Unit 2: Properties of Integer Exponents (4 Weeks)**:

Focus on properties of integer exponents, including simplification and equivalence.

Transition to more abstract problems, such as solving equations involving exponents.

1. **Unit 3: Square Roots, Cube Roots, and Rational/Irrational Numbers (4 Weeks)**:

Introduce square roots, cube roots, and irrational numbers through real-world and geometric contexts.

Emphasize reasoning with rational and irrational numbers.

1. **Unit 4: Solving Linear Equations (5 Weeks)**:

Solve one-variable linear equations with rational coefficients.

Explore cases of unique solutions, no solution, and infinite solutions.

1. **Assessment and Cumulative Review (2 Weeks)**:

Summative assessments on all units.

Include integrated project-based tasks, such as real-world problem-solving involving equations and exponents.

**Connection Section**

**1. Building from Previous Knowledge**

**7.NS Connections**:

Establishes a foundation in operations with rational numbers, critical for understanding algebraic manipulations.

Extends to concepts like square roots and the behavior of rational numbers in equations.

**2. Preparing for 8.EE**

**8.EE Connections**:

Integer exponents and square roots directly prepare students for exponential functions and advanced algebra.

Solving linear equations lays the groundwork for systems of equations in high school algebra.

**3. Real-World Relevance**

Students apply these concepts to real-life scenarios, such as scientific notation, budgeting, and geometric reasoning, ensuring they see the practicality of mathematics.

This crossover curriculum is designed to create a cohesive learning experience, aligning concepts and building proficiency for success in more advanced mathematical topics.

In New Mexico, the **6th-grade Geometry standard (6.G.A)** encompasses the following key topics:

1. **Area of Polygons**

Calculate the area of right triangles, other triangles, special quadrilaterals, and polygons by composing them into rectangles or decomposing them into triangles and other shapes.

Apply these techniques to solve real-world and mathematical problems.

1. **Volume of Right Rectangular Prisms**

Find the volume of right rectangular prisms with fractional edge lengths by packing them with unit cubes of the appropriate unit fraction edge lengths.

Show that the volume is the same as would be found by multiplying the edge lengths of the prism.

Apply the formulas V= l × w × h and V = b × h to find volumes of right rectangular prisms with fractional edge lengths in real-world and mathematical problems.

1. **Surface Area**

Represent three-dimensional figures using nets made up of rectangles and triangles.

Use the nets to find the surface area of these figures.

Apply these techniques to solve real-world and mathematical problems

In New Mexico, the **7th-grade Geometry standards (7.G)** encompass two main clusters, each focusing on specific aspects of geometric understanding and application:

**1. Draw, Construct, and Describe Geometrical Figures and Describe the Relationships Between Them**

* **7.G.A.1**: 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.
* **7.G.A.2**: Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
* **7.G.A.3**: Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

**2. Solve Real-Life and Mathematical Problems Involving Angle Measure, Area, Surface Area, and Volume**

* **7.G.B.4**: Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
* **7.G.B.5**: Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
* **7.G.B.6**: 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.

Below is a **Crossover Curriculum** integrating New Mexico's **6.G and 7.G Geometry standards**. It includes review standards from earlier grades, the main standards from 6.G and 7.G, supplement standards to support broader understanding, and a timeline for teaching.

**Crossover Curriculum for 6.G and 7.G**

**Unit 1: Geometry Foundations (2 weeks)**

**Purpose**: Review critical concepts to prepare students for 6.G and 7.G.

* **Review Standards**:

**4.MD.C.5**: Understand concepts of angles and measure angles in whole-number degrees using a protractor.

**5.G.B.3**: Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories.

**5.G.B.4**: Classify two-dimensional figures in a hierarchy based on properties.

* **Activities**:

Use protractors and rulers to measure and classify angles.

Review classification of polygons (triangles, quadrilaterals).

Discuss relationships between two-dimensional figures.

**Unit 2: Area and Surface Area (4 weeks)**

**Purpose**: Develop skills to calculate areas of polygons and surface areas of 3D shapes.

* **Standards**:

**6.G.A.1**: Find the area of triangles, quadrilaterals, and polygons by composing/decomposing shapes.

**6.G.A.4**: Represent 3D figures using nets and calculate surface area.

**7.G.B.6**: Solve problems involving area, surface area, and volume of polygons and prisms.

* **Supplement Standards**:

**6.NS.C.8**: Solve real-world problems involving distances on a coordinate plane.

**7.RP.A.1**: Understand and apply ratios and proportional reasoning when scaling shapes.

* **Activities**:

Solve problems involving real-world applications of polygon areas.

Create nets for prisms and pyramids to calculate surface areas.

Connect scaling shapes to surface area changes.

**Unit 3: Volume of Prisms (3 weeks)**

**Purpose**: Understand and calculate volume of 3D shapes, building on foundational skills.

* **Standards**:

**6.G.A.2**: Solve volume problems for rectangular prisms with fractional edge lengths.

**7.G.B.6**: Apply knowledge to more complex 3D figures (composite shapes).

* **Supplement Standards**:

**6.EE.A.2**: Write and evaluate expressions for geometric formulas.

**7.RP.A.2**: Use proportional relationships to solve multi-step volume problems.

* **Activities**:

Build models of prisms to explore fractional dimensions.

Apply formulas V=l × w × h and V = b × h.

Solve word problems involving liquid volumes and container design.

**Unit 4: Angle Relationships and Scale Drawings (4 weeks)**

**Purpose**: Develop reasoning skills with angles and scale.

**Standards**:

* + **6.G.A.3**: Understand 2D shapes as slices of 3D figures.
  + **7.G.A.1**: Solve problems with scale drawings.
  + **7.G.B.5**: Use angle relationships (supplementary, complementary, vertical, and adjacent).

**Supplement Standards**:

* + **7.EE.B.4**: Solve equations derived from geometric relationships.
  + **6.RP.A.3**: Use proportional reasoning for scale.

**Activities**:

* + Work on hands-on slicing of 3D shapes to visualize cross-sections.
  + Practice solving problems involving scaled floor plans and maps.
  + Explore real-world applications of angle relationships in design.

**Unit 5: Circles and Advanced Problem Solving (3 weeks)**

**Purpose**: Build a deeper understanding of circles and multi-step geometric problems.

**Standards**:

**7.G.B.4**: Derive and apply formulas for area and circumference of circles.

**7.G.B.6**: Apply area and volume concepts to composite figures.

* **Supplement Standards**:

**7.NS.A.3**: Solve real-world problems involving rational numbers.

**8.G.C.9**: Explore advanced volume concepts for cylinders and spheres.

* **Activities**:

Derive the relationship between diameter, radius, and circumference.

Apply circle formulas to real-world contexts (e.g., designing circular gardens).

Solve composite problems combining circles and polygons.

**Timeline Overview**

| **Week** | **Focus Area** | **Key Standards** |
| --- | --- | --- |
| 1-2 | Geometry Foundations | 4.MD.C.5, 5.G.B.3, 5.G.B.4 |
| 3-6 | Area and Surface Area | 6.G.A.1, 6.G.A.4, 7.G.B.6 |
| 7-9 | Volume of Prisms | 6.G.A.2, 7.G.B.6 |
| 10-13 | Angle Relationships and Scale Drawings | 6.G.A.3, 7.G.A.1, 7.G.B.5 |
| 14-16 | Circles and Advanced Problems | 7.G.B.4, 7.G.B.6 |

In New Mexico, the **8th-grade Geometry standards (8.G)** focus on three main clusters:

1. **Understand Congruence and Similarity Using Physical Models, Transparencies, or Geometry Software**
   * **8.G.A.1**: Verify experimentally the properties of rotations, reflections, and translations:
     + Lines are mapped to lines, and line segments to line segments of the same length.
     + Angles are mapped to angles of the same measure.
     + Parallel lines are mapped to parallel lines.
   * **8.G.A.2**: Understand 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; describe a sequence that exhibits the congruence between them.
   * **8.G.A.3**: Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
   * **8.G.A.4**: Understand 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; describe a sequence that exhibits the similarity between them.
   * **8.G.A.5**: Use informal arguments to establish facts about the angle sum and exterior angle of triangles, the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.
2. **Understand and Apply the Pythagorean Theorem**
   * **8.G.B.6**: Explain a proof of the Pythagorean Theorem and its converse.
   * **8.G.B.7**: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
   * **8.G.B.8**: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
3. **Solve Real-World and Mathematical Problems Involving Volume of Cylinders, Cones, and Spheres**
   * **8.G.C.9**: Know the formulas for the volumes of cones, cylinders, and spheres, and use them to solve real-world and mathematical problems.

**Crossover Curriculum for 7.G and 8.G Geometry Standards**

This curriculum integrates **7.G (7th grade Geometry)** and **8.G (8th grade Geometry)** standards. It builds on foundational knowledge, introduces key concepts, and progresses toward advanced geometry topics. The curriculum includes review standards, primary standards, supplement standards, and a timeline.

**Unit 1: Foundations of Geometry and Transformations (2 weeks)**

**Purpose**: Review key geometric concepts and introduce transformations.

**Review Standards**:

**6.G.A.1**: Solve problems involving areas of polygons.

**6.G.A.4**: Represent 3D figures using nets and calculate surface area.

**Standards**:

**7.G.A.1**: Solve problems involving scale drawings of geometric figures.

**8.G.A.1**: Verify properties of rotations, reflections, and translations using physical models or software.

**Supplement Standards**:

* + **7.RP.A.2**: Use proportional reasoning in scale drawings.
  + **8.EE.B.6**: Understand the concept of slope as a rate of change in coordinate geometry.

**Activities**:

* + Hands-on exploration with scale drawings and real-world applications.
  + Use geometry software to experiment with transformations (translations, rotations, reflections).

**Unit 2: Congruence and Similarity (3 weeks)**

**Purpose**: Deepen understanding of congruence and similarity through transformations and problem-solving.

**Standards**:

* + **7.G.A.2**: Draw geometric shapes with given conditions; construct triangles based on side lengths and angles.
  + **8.G.A.2**: Understand congruence of two-dimensional figures through transformations.
  + **8.G.A.4**: Understand similarity through transformations, including dilations.

**Supplement Standards**:

* + **7.G.A.3**: Describe two-dimensional slices of three-dimensional figures.
  + **8.EE.B.5**: Interpret the relationship between proportionality and linearity in similar shapes.

**Activities**:

* + Explore congruence and similarity using dynamic geometry software.
  + Solve problems involving the angle-angle criterion for similarity of triangles.
  + Analyze dilations using coordinate plane transformations.

**Unit 3: Angle Relationships (2 weeks)**

**Purpose**: Develop problem-solving skills with angle relationships.

**Standards**:

* + **7.G.B.5**: Use facts about supplementary, complementary, vertical, and adjacent angles to write and solve equations.
  + **8.G.A.5**: Informally prove angle properties, including the angle sum of a triangle, exterior angles, and angles formed by parallel lines and transversals.

**Supplement Standards**:

* + **8.EE.C.7**: Solve linear equations related to angle problems.
  + **6.EE.A.2**: Write expressions and equations for geometric relationships.

**Activities**:

* + Use diagrams and manipulatives to explore parallel line and transversal angle relationships.
  + Solve real-world problems involving multi-step angle equations.

**Unit 4: Pythagorean Theorem (3 weeks)**

**Purpose**: Introduce and apply the Pythagorean Theorem in two and three dimensions.

**Standards**:

* + **8.G.B.6**: Explain a proof of the Pythagorean Theorem and its converse.
  + **8.G.B.7**: Apply the theorem to find unknown side lengths in right triangles in real-world problems.
  + **8.G.B.8**: Use the Pythagorean Theorem to calculate distances in a coordinate plane.

**Supplement Standards**:

* + **7.G.B.6**: Solve real-world problems involving area and volume.
  + **8.EE.A.2**: Work with square roots when solving the Pythagorean Theorem.

**Activities**:

* + Hands-on activities to construct and verify the theorem.
  + Apply the theorem in coordinate geometry and real-world contexts (e.g., navigation and design).

**Unit 5: Volume of 3D Figures (3 weeks)**

**Purpose**: Build on volume understanding for cylinders, cones, and spheres.

**Standards**:

* + **7.G.B.6**: Solve problems involving the volume of 3D figures composed of polygons, cubes, and prisms.
  + **8.G.C.9**: Know and apply formulas for the volumes of cylinders, cones, and spheres.

**Supplement Standards**:

* + **6.G.A.2**: Solve volume problems for rectangular prisms with fractional edge lengths.
  + **8.EE.C.8**: Solve systems of equations in contexts involving geometry.

**Activities**:

* + Explore formulas for volume using manipulatives and real-world problems (e.g., calculating water tank capacity).
  + Use digital simulations to visualize volumes of spheres, cylinders, and cones.

**Unit 6: Advanced Problem Solving and Applications (2 weeks)**

**Purpose**: Synthesize learning through complex, multi-step problems.

**Standards**:

* + **8.G.A.3**: Describe the effects of transformations on two-dimensional figures in coordinate geometry.
  + **8.G.C.9**: Apply volume formulas to solve real-world problems involving composite figures.

**Supplement Standards**:

* + **8.EE.C.7**: Apply systems of equations to solve geometric problems.
  + **7.RP.A.3**: Solve real-world ratio and proportion problems in geometry.

**Activities**:

* + Use transformations and volume calculations in engineering or architectural projects.
  + Solve integrated problems requiring application of multiple standards.

**Timeline Overview**

| **Week** | **Unit** | **Key Standards** |
| --- | --- | --- |
| 1-2 | Foundations of Geometry and Transformations | 6.G.A.1, 6.G.A.4, 7.G.A.1, 8.G.A.1 |
| 3-5 | Congruence and Similarity | 7.G.A.2, 7.G.A.3, 8.G.A.2, 8.G.A.4 |
| 6-7 | Angle Relationships | 7.G.B.5, 8.G.A.5 |
| 8-10 | Pythagorean Theorem | 8.G.B.6, 8.G.B.7, 8.G.B.8 |
| 11-13 | Volume of 3D Figures | 7.G.B.6, 8.G.C.9 |
| 14-15 | Advanced Problem Solving and Applications | 8.G.A.3, 8.G.C.9 |

The **New Mexico G-GPE.7 standard** focuses on applying coordinate geometry to calculate perimeters and areas of specific polygons. The standard is defined as follows:

**G-GPE.7**: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

**Key Topics Under This Standard**:

1. **Distance Formula Application**:

Utilize the distance formula to determine the lengths of sides in polygons plotted on the coordinate plane.

1. **Perimeter Calculation**:
   * Compute the perimeter of polygons, such as triangles and rectangles, by summing the lengths of their sides derived from coordinate points.
2. **Area Calculation**:
   * **Triangles**: Apply the Area formula or use vertex coordinates with the formula
   * **Rectangles**: Calculate area by multiplying the lengths of two adjacent sides, determined using the distance formula.
3. **Coordinate Geometry in Proofs**:

Employ algebraic methods to prove geometric properties, such as verifying whether a quadrilateral is a rectangle by confirming right angles and equal opposite sides using slopes and distances.

1. **Modeling with Geometry**:

Solve real-world problems by modeling scenarios with geometric figures on the coordinate plane, facilitating the calculation of distances, perimeters, and areas.

**Crossover Curriculum for 8.G and G-GPE.7**

This curriculum integrates **8.G (8th Grade Geometry)** and **G-GPE.7 (High School Geometry)** standards, combining foundational concepts in transformations and the Pythagorean Theorem with advanced coordinate geometry applications. It includes review standards, core standards, supplementary standards, and a detailed timeline.

**Unit 1: Foundations of Coordinate Geometry (2 weeks)**

**Purpose**: Review essential geometry concepts to prepare for advanced coordinate geometry.

* **Review Standards**:
  + **7.G.A.1**: Solve problems involving scale drawings.
  + **8.G.B.6**: Explain the Pythagorean Theorem and its converse.
  + **8.G.B.8**: Use the Pythagorean Theorem to find distances in the coordinate plane.
* **Core Standards**:
  + **8.G.A.3**: Describe the effects of transformations (translations, rotations, reflections, dilations) on figures in the coordinate plane.
* **Supplement Standards**:
  + **6.NS.C.8**: Solve problems involving distances on a coordinate plane.
  + **8.EE.B.6**: Use slope to analyze relationships in coordinate systems.
* **Activities**:
  + Explore transformations (translations, rotations, reflections) using graphing tools.
  + Apply the Pythagorean Theorem to calculate distances between points.
  + Introduce the concept of slopes and line equations.

**Unit 2: Distance, Midpoint, and Slope (3 weeks)**

**Purpose**: Build foundational skills for analyzing polygons on the coordinate plane.

* **Core Standards**:
  + **8.G.B.8**: Apply the Pythagorean Theorem to calculate distances.
  + **G-GPE.7**: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles.
* **Supplement Standards**:
  + **8.EE.C.7**: Solve linear equations in real-world geometric contexts.
  + **HSF.IF.C.7**: Analyze linear equations and their graphs.
* **Activities**:
  + Practice using the distance formula for line segments.
  + Explore midpoint formula applications in geometric contexts.
  + Solve problems involving the slopes of sides in polygons.

**Unit 3: Perimeters and Areas of Polygons (3 weeks)**

**Purpose**: Develop skills to calculate perimeters and areas of polygons using coordinate geometry.

* **Core Standards**:
  + **G-GPE.7**: Use coordinates to compute perimeters and areas of polygons.
  + **8.G.A.2**: Understand congruence through transformations.
* **Supplement Standards**:
  + **8.EE.B.5**: Understand proportional relationships to interpret geometric figures.
  + **8.G.B.6**: Verify congruence using transformations.
* **Activities**:
  + Use the coordinate plane to compute the perimeter of polygons.
  + Apply area formulas for triangles and rectangles using coordinates.
  + Solve real-world problems involving land measurement.

**Unit 4: Coordinate Proofs and Applications (4 weeks)**

**Purpose**: Introduce algebraic proofs and real-world applications of coordinate geometry.

* **Core Standards**:
  + **G-GPE.7**: Apply coordinate geometry to polygons for area and perimeter.
  + **8.G.B.7**: Apply the Pythagorean Theorem to solve problems in two and three dimensions.
* **Supplement Standards**:
  + **HSG.GPE.B.5**: Prove the slope criteria for parallel and perpendicular lines.
  + **HSF.BF.A.1**: Model real-world problems with geometric figures on the coordinate plane.
* **Activities**:
  + Prove geometric properties (e.g., parallelograms, rectangles) using coordinates.
  + Solve multi-step problems involving polygons and transformations.
  + Create real-world models (e.g., city grids, architectural designs) for analysis.

**Unit 5: Advanced Problem Solving (3 weeks)**

**Purpose**: Synthesize learning through complex problems involving multiple standards.

* **Core Standards**:
  + **G-GPE.7**: Solve advanced problems with coordinate geometry.
  + **8.G.C.9**: Solve volume problems for cylinders, cones, and spheres as extensions.
* **Supplement Standards**:
  + **HSG.GMD.A.1**: Explain formulas for areas and volumes in advanced geometric contexts.
  + **HSF.IF.C.8**: Interpret functions and relationships in geometric modeling.
* **Activities**:
  + Solve composite problems combining transformations, area, and perimeter.
  + Extend to 3D geometry by connecting 2D polygons to volumes of solids.
  + Develop project-based assessments to showcase understanding.

**Timeline Overview**

| **Week** | **Unit** | **Key Standards** |
| --- | --- | --- |
| 1-2 | Foundations of Coordinate Geometry | 8.G.A.3, 8.G.B.6, 8.G.B.8 |
| 3-5 | Distance, Midpoint, and Slope | 8.G.B.8, G-GPE.7 |
| 6-8 | Perimeters and Areas of Polygons | G-GPE.7, 8.G.A.2 |
| 9-12 | Coordinate Proofs and Applications | G-GPE.7, 8.G.B.7 |
| 13-15 | Advanced Problem Solving | G-GPE.7, 8.G.C.9 |

**Key Goals of the Curriculum**

1. Develop a deep understanding of transformations and their effects on geometric figures.
2. Enable students to calculate distances, perimeters, and areas using coordinate geometry.
3. Introduce algebraic methods for proving geometric properties.
4. Connect 2D geometry to real-world applications and 3D extensions.