High School (9-12)
Gateway High School
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Gateway School District
Curriculum Map

Curriculum Map: Mathematics

Course: Algebra I
Grade(s): 9

Unit 1: Rational Numbers

Brief Summary of Unit
Students combine rational numbers by adding, subtracting, multiplying, and dividing, by using Identity and Inverse Properties and modeling with a number line. Then they combine the operations of addition and multiplication by using the Distributive Property. Finally the properties of real numbers are summarized and students identify which property they use as they simplify expressions.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

The Students will be Able to:

1. Add Rational Numbers
2. Apply Addition
3. Subtract Rational Numbers
4. Apply Subtraction
5. Multiply Rational Numbers
6. Divide Rational Numbers
7. Use the Distributive Property
8. Simplify Algebraic Expressions
9. Simplify Square Roots

Understandings:	Essential Questions:
1. **Algebra uses symbols to represent quantities that are unknown or that vary.** 2. **Mathematical phrases and real-world relationships can be represented using symbols and operations.** 3. **Powers can be used to shorten the representation of repeated multiplication, such as 2 x 2 x 2 x 2 x 2.** 4. **When simplifying an expression, operations must be performed in the right order.**	**1.** How can you represent quantities, patterns, and relationships? **2.** How are properties related to algebra?

5. **When evaluating an expression, values of the variables must be substituted into the expression before simplifying.** 6. **Numbers can be classified by their characteristics.** 7. **Some types of numbers can be represented on the number line.** 8. **Relationships that are always true for real numbers are called properties, which are rules used to rewrite and compare expressions.** 9. **Important properties include the commutative, associative and identity properties, the zero property of multiplication and the multiplication property of -1.** 10. **Any real numbers can be added or subtracted using a number line model or using rules involving absolute value.** 11. **Subtracting a real number is equivalent to adding its opposite: a – b = a + (-b)** 12. **The rules for multiplying real numbers are related to the properties of real numbers and the definitions of operations.** 13. **The product or quotient of two real numbers with different signs is negative.** 14. **The product or quotient of two real numbers with the same sign is positive.** 15. **The distributive property can be used to simplify the product of a number and a sum or difference.** 16. **An algebraic expression can be simplified by combining the parts of the expression that are alike.**	

Stage Two—Assessment Evidence

Performance Tasks:

Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 2: Solving Equations

Brief Summary of Unit

Students solve equation, and problems involving equations, using deductive reasoning, the Distributive Property, and variables on both sides. They define variables in terms of other variables, and model distance-rate-time problems.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

The Students will be Able to:

1. Solve One-Step Equations
2. Solve Two-Step Equations
3. Use Deductive Reasoning
4. Use the Distributive Property to Combine Like Terms
5. Use the Distributive Property to Solve Equations
6. Solve Equations with Variables on Both Sides
7. Solve Identities and Equations with No Solution
8. Transform Formulas
9. Define Variables
10. Solve Distance-Rate-Time Problems

Understandings:

1. **Equivalent equations are equations that have the same solution(s).**
2. **The solution of a one-step equation can be found by using the properties of equality and inverse operations to write a simpler equation.**
3. **The solution of a two-step equation can be found using the properties of equality and inverse operations to form a series of simpler equations.**
4. **The properties of equality can be used repeatedly to isolate the variable.**
5. **The solution of a multi-step equation can be found using the properties of equality and real numbers and inverse operations to form a series of simpler equations.**
6. **The solution of an equation with variables on both sides can be found using the properties of equality and inverse operations to form a series of simpler equations.**
7. **A literal equation is an equation that involves two or more variables.**
8. **The solution of a literal equation can be found using the properties of equality and inverse operations to form a series of simpler equations.**

Essential Questions:

1. Can equations that appear to be different be equivalent?
2. How can you solve equations?

Stage Two—Assessment Evidence

Performance Tasks:

Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 3: Solving Inequalities

Brief Summary of Unit

Students extend the skills of the previous unit, related to solving various kinds of equations, to the solving of inequalities. Many of the procedures used are the same, reflecting the fact that the properties for inequalities are very similar to those for equations. Students solve and graph inequalities using addition, subtraction, multiplication, and division, progressing from one-step to multi-step inequalities, first with the variable on one side only, and then with variables on both sides. They also solve compound inequalities as well as equations and inequalities containing absolute values.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

The Students will be Able to:

1. Identify Solutions of Inequalities
2. Graph and Write Inequalities in One Variable
3. Use Addition, Subtraction, Multiplication, and Division to Solve Inequalities
4. Solve Inequalities with Variables on One Side
5. Solve Inequalities with Variables on Both Sides
6. Solve Compound Inequalities Containing "And" or "Or"
7. Solve Absolute Value Equations

Understandings:

1. **An inequality is a mathematical sentence that uses an inequality symbol to compare the values of two expressions.**
2. **Inequalities can be represented with symbols.**
3. **The solution of an inequality can be represented on a number line.**
4. **In the same way equations are solved using properties of equality, inequalities are solved using properties of inequality.**
5. **The Addition and Subtraction Properties of Inequality can be used to solve inequalities.**
6. **In the same way multiplication and division are used to solve equations, multiplication and division can be used to solve inequalities.**

Essential Questions:

1. How do you represent relationships between quantities that are not equal?
2. Can inequalities that appear to be different be equivalent?
3. How can you solve inequalities?

7. **When multiplying or dividing by a negative number, it is necessary to reverse the inequality sign.** 8. **In the same way multi-step equations are solved using properties of equality, multi-step inequalities are solved using properties of inequality.** 9. **The properties of inequality are used to transform the original inequality into a series of simpler, equivalent inequalities.** 10. **The solutions of a compound inequality are either the overlap or combination of the solution sets of distinct inequalities.** 11. **The graph of a compound inequality with the word and contains the overlap of the graphs of the two inequalities.** 12. **The graph of a compound inequality with the word or contains each graph of the two inequalities.** 13. **An equivalent pair of linear equations can be used to solve absolute value equations.** 14. **Absolute value equations can be solved by first isolating the absolute value expression, if necessary, then writing an equivalent pair of linear equations.** 15. **An equivalent pair of inequalities can be used to solve absolute value inequalities.** 16. **Absolute value inequalities can be solved by first isolating the absolute value expression, if necessary, then writing an equivalent pair of inequalities.**	

Stage Two—Assessment Evidence
Performance Tasks:
Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 4: Graphs and Functions

Brief Summary of Unit
This chapter helps students build on their knowledge of equations by relating a graph to the story it

tells and to the equation whose solutions it picture. Students read and use functional notation as they model function rules with table and graphs.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

The Students will be Able to:

1. Interpret , Sketch and Analyze Graphs
2. Identify Relations and Functions
3. Evaluate Functions
4. Model function using rules, tables, and graphs
5. Write a function rule for a function
6. Find domain and range
7. Apply Vertical Line Test

Understandings:

1. **Graphs can be used to visually represent the relationship between two variable quantities as they change.**
2. **The value of one variable may be uniquely determined by the value of another variable. Such relationships may be represented using words, tables, equations, sets of ordered pairs and graphs.**
3. **Functions are a special type of relation where each value in the domain is paired with exactly one value in the range.**
4. **Some sequences have functions rules that can be used to find any term of the sequence.**
5. **Many real-world functional relationships can be represented by equations. Equations can be used to find the solution of given real-world problems.**
6. **A vertical line test shows whether a relation is a function.**

Essential Questions:

1. How can you represent and describe functions?
2. Can functions describe real-world situations?

Stage Two—Assessment Evidence

Performance Tasks:

Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 5: Solving Linear Equations and Their Graphs

Brief Summary of Unit
This chapter introduces rates of change and defines slope of a line as the ratio of the vertical change to the horizontal change. This leads to graphing a linear equation and writing the equation of a line in three different forms, using the slope, intercepts, or points on the line. From there, the characteristics of parallel and perpendicular lines are examines. All of these topics are applied together to find trend lines and lines of best fit.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

The Students will be Able to:

1. Find Rates of Change
2. Find Slope
3. Write Linear Equations
4. Graph Linear Equations
5. Interpret Linear Graphs
6. Graph Equations Using Intercepts
7. Write Equations in Standard Form
8. Use Point-Slope Form
9. Write Linear Equations Using Data
10. Identify the slope and the y intercept of an equation of a line
11. Find x- and y- intercepts
12. Write Equations of Parallel Lines
13. Determine Whether Lines Are Parallel or Perpendicular
14. Write Equations of Perpendicular Lines
15. Write an Equation for a Trend Line
16. Write an Equation for a Line of Best Fit
17. Use Trend Lines and Lines of Best Fit to make Predictions

Understandings:

1. **Ratios can show the relationship between two changing quantities, such as vertical and horizontal change.**
2. **The slope of a line is the ratio of vertical change over horizontal change.**
3. **The slope of a line can be positive, negative, zero, or undefined.**
4. **The slope and y-intercept of a line can be used to write and graph an equation of the line.**
5. **One form for writing the equation of a line is the slope-intercept form.**
6. **One form for writing the equation of a line is the point-slope form.**
7. **Any two equations for the same line are equivalent.**
8. **The standard form of a linear equation is Ax + By=C, where A, B, and C are real numbers, and A and B are not both zero.**
9. **The relationship between two lines can be determined by comparing their slopes and y-intercepts.**

Essential Questions:

1. What does the slope of a line indicate about the line?
2. What information does the equation of a line give you?
3. How can you make predictions based on a scatter plot?

10. **Graphing ordered pairs is a way to determine whether two sets of numerical data are related.** 11. **If two sets of data are related, it may be possible to use a line to estimate or predict values.**	

Stage Two—Assessment Evidence

Performance Tasks:

Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 6: Systems of Equations and Inequalities

Brief Summary of Unit

In this chapter, students find the solution of a system of linear equations by graphing. They learn the three possibilities for the solution of a system of two equations: parallel lines, lines that coincide, and lines that intersect. This leads to algebraic methods for solving a system of equations, and then to solving problems by writing a system of linear equations. Graphing linear equations is compared to graphing linear inequalities and solving systems of linear inequalities by graphing.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

The Students will be Able to:

1. Solve systems by graphing
2. Analyze special types of systems
3. Solve systems by substitution
4. Solve systems of equations by eliminating a variable
5. Multiply first to solve systems
6. Write systems of linear equations
7. Graph linear inequalities
8. Model real-world situations
9. Solve systems of linear inequalities by graphing
10. Write and use systems of linear inequalities

Understandings:	**Essential Questions:**
1. **Systems of linear equations can be used to model problems. Systems of equations can be solved by graphing, substitution, or eliminating a variable.** 2. **A linear inequality in two variables has an infinite number of solutions. These solutions can be represented in the coordinate plane as the set of all points on one side of a boundary line. The solutions of a system of linear inequalities can be represented by the region where the graphs of the**	**1.** How can you solve a system of equations or inequalities? **2.** Can systems of equations model real-world situations?

individual inequalities overlap. 3. **Some problems can be modeled by systems of linear equations.** 4. **Solutions to a linear inequality in two variables can be represented in the coordinate plane as the set of all points on one side of a boundary line. The solutions of a system of linear inequalities can be represented by the region where the graphs of the individual inequalities overlap.**	

Stage Two—Assessment Evidence

Performance Tasks:

Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 7: Exponents and Exponential Functions

Brief Summary of Unit

This chapter introduces using zero and negative exponents, and evaluating exponential equations. Scientific notation illustrates a common use for exponents. Problems using scientific notation and other exponential expressions illustrate multiplying and dividing powers, raising a power to a power, and raising products and quotients to a power.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Simplify expressions with Zero and Negative Exponents
2. Evaluate Exponential Expressions
3. Write numbers in scientific and standard notation
4. Use scientific notation
5. Multiply exponential expressions
6. Multiply numbers in scientific notation
7. Raise a Power to a Power
8. Raise a Product to a Power
9. Divide Powers with the same base
10. Raise a Quotient to a power
11. Simplify radicals
12. Simplify sum, difference and products of radical expressions
13. Solve equations containing radicals

Understandings:	**Essential Questions:**
1. **The idea of exponents can be extended to include zero and negative exponents.** 2. **Powers of 10 are an easy way to write and compare very large or very small numbers. Scientific notation is a shorthand way to write numbers using powers of 10.** 3. **Properties of exponents make it easier**	**1.** How can you represent very large and very small numbers? **2.** How can you simplify expressions involving exponents?

to simplify products or quotients of powers with the same base or powers raised to a power or products raise to a power.	

Stage Two—Assessment Evidence
Performance Tasks:
Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 8: Polynomials and Factoring

Brief Summary of Unit
This chapter helps students build knowledge and skills relative to polynomials-the basic building blocks of algebraic expressions. These skills include combining monomials, binomials, and polynomials using the operations of addition, subtraction, and multiplication. Factoring the inverse process for multiplying polynomials, is used to factor trinomials, including recognizing certain special patterns and factoring by grouping.

Stage One—Desired Results
Established Goals: (Standards of Learning, Content Standards) 1. Name and describe polynomials 2. Add and subtract polynomials 3. Distributing a Monomial 4. Factor a monomial from a polynomial 5. Multiply two binomials 6. Multiply a binomial and a trinomial 7. Square a binomial 8. Find the difference of squares 9. Factor Trinomials 10. Factor Perfect Square Trinomials

Understandings:	**Essential Questions:**
1. **Factoring polynomials reverses the multiplication process** 2. **Monomials can be used to form larger expressions called polynomials. Polynomials can be added and subtracted.** 3. **Sometimes the greatest common factor should be factored out before the remaining polynomial is factored.** 4. **There are several ways to find the product of two binomials, including**	**1.** Can two algebraic expressions that appear to be different be equivalent? **2.** How are the properties of real numbers related to polynomials?

models, algebra, and tables. 5. **Some trinomials of the form and some polynomials of a degree greater than 2 can be factored to equivalent forms which are the product of two binomials.** 6. **The properties of real numbers can be used to multiply a monomial by a polynomial or simplify the product of binomials.** 7. **The properties of real numbers can be also used to factor some trinomials of the form and some polynomials of a degree greater than two.**	
Stage Two—Assessment Evidence	
Performance Tasks:	
Other Evidence: :(quizzes, tests and so on)	
Stage Three—Learning Plan	

Unit 9: Probability and Statistics

Brief Summary of Unit	
Students can find the mean, median, and mode, and range for data sets. Finally, counting methods and permutations and combinations are applied to various kinds of problems.	
Stage One—Desired Results	
Established Goals: (Standards of Learning, Content Standards) 1. Find mean, median, and mode 2. Create/Use Stem & Leaf and Box & Whisker Plots 3. To Use the Multiplication Counting Principle 4. To Find Combinations 5. To Find Probability with Counting Techniques.	
Understandings: 1. **Finding centers.** 2. **Using graphical representation of data sets.** 3. **Interpreting graphing representations of data sets.** 4. **When to use a permutation or a combination.**	**Essential Questions:** **1.** Which graph will best represent the data? **2.** Which center best represents the data?
Stage Two—Assessment Evidence	
Performance Tasks:	

Other Evidence: :(quizzes, tests and so on)
Stage Three—Learning Plan