

Boonton School District

Course Title:	Pre-Algebra	Grade Level(s):	9		
Curriculum Area / Level:	Mathematics	Credits:	5		
Course prerequisites and/or co-requisites:	Grade 8 Mathematics				
Course Description:	<p>This course is designed for those grade 9 students who are not ready to be introduced to a traditional Algebra 1 course. Topics will include set theory, operations on signed numbers, combining like terms, solving basic linear equations, performing basic operations on matrices, graphing, probability and statistics (including data analysis). Students will also learn the functions of the TI-84 Plus. After successful completion of this introductory course, students will take Algebra 1.</p>				
Created by:	Evan Levy	Date:	8/1/16	BOE Approval:	9/26/16
District Equity Statement:	<p>As required by state law, it is the policy of Boonton School District not to discriminate on the basis of race, color, creed, religion, sex, ancestry, national origin, social or economic status, pregnancy, or physical handicap in its educational programs or activities and to maintain a learning environment that is free from sexual harassment. Courses of study and instructional materials shall be designed and selected in order to eliminate discrimination and promote understanding, sex equity, and mutual respect among people. No course offering, including but not limited to physical education, health, technology education, vocational, home economics, music and adult education, shall be limited on the basis of race, color, creed, religion, sex, ancestry, national origin, social or economic status, pregnancy, or physical handicap. Furthermore, there shall be no discrimination against students as to any educational activity or program because of pregnancy, childbirth, pregnancy-related disabilities, actual or potential parenthood, or family or marital status. If a student requests to be excluded or a physician certifies that such is necessary for her physical, mental, or emotional well-being, she must be provided with adequate and timely opportunity for instruction to continue or make up her schoolwork without prejudice or penalty.</p>				

Division of Umbrella & Mini Units

Umbrella Unit 1 Topic / Name:

Algebra and Integers

Mini Units

1A. The Tools of Algebra

1B. Integers

1C. Equations

Umbrella Unit 2 Topic / Name:

Algebra and Rational Numbers

Mini Units

2A. Factors and Fractions

2B. Rational Numbers

2C. Ratio, Proportion, and Percent

Umbrella Unit 3 Topic / Name:

Linear Equations, Inequalities, and Functions

Mini Units

3A. Equations and Inequalities

3B. Functions and Graphing

3C. If time permits: Polynomials and Nonlinear Functions

Umbrella Unit 4 Topic / Name:

Applying Algebra to Geometry

Mini Unit(s)

4A. Real Numbers and Right Triangles

4B. Two-Dimensional Figures

4C. Three-Dimensional Figures

4D. If time permits: Statistics and Probability

UMBRELLA UNIT 1

Title:

Algebra and Integers

Duration:

9 weeks

Essential Questions:

What relationship exists between addition and multiplication?

What relationship exists between subtraction and division?

What is the role of the order of operations when simplifying numerical expressions?

What are the different ways numbers can be represented?

What is a rational number and how can different values be represented to help compare?

How do we operate rational expressions with unlike denominators?

What are exponents and what types of numbers do they produce?

How do the properties multiplication relate to the properties of exponents?

Why is it helpful to use a problem-solving plan to solve problems?

Summative Assessments: (Assessment at the end the learning period)	Chapter tests with open ended questions and short answer questions Projects involving real-world applications
Formative Assessments: (Ongoing assessments during the learning period)	Glencoe online quizzes, textbook practice problems by section, quizzes periodically on subtopics
Differentiation:	EdPuzzle Flipped Classroom activities, Khan Academy for reinforcement and/or Flipped Classroom (https://www.khanacademy.org/math/algebra-home/pre-algebra#table-of-contents), Student choice for projects involving real-world applications, Student choice for reinforcement activities from Glencoe's website

TECHNOLOGY STANDARD (STANDARD 8)

CPI #	CUMULATIVE PROGRESS INDICATOR (CPI)
8.1.8.A.4	Generate a spreadsheet to calculate, graph and present information.
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.

21ST CENTURY LIFE AND CAREER (STANDARD 9)

CPI #	CUMULATIVE PROGRESS INDICATOR (CPI)
9.3.ST.2	Use technology to acquire, manipulate, analyze and report data.
9.3.ST.3	Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
9.3.ST.4	Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.

9.3.ST-ET.1	Use STEM concepts and processes to solve problems involving design and/or production.
9.3.ST-ET.2	Display and communicate STEM information.
9.3.ST-ET.5	Apply the knowledge learned in STEM to solve problems.
9.3.ST-SM.3	Analyze the impact that science and mathematics has on society.

MINI UNIT 1A	
Title:	The Tools of Algebra
Duration:	3 weeks
Overview:	Students will be introduced to and apply the four-step problem solving process, translate phrases into mathematical expressions, incorporate the properties of addition and multiplication, write and solve equations, analyze relations, and scatterplots
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
The steps involved when forming a conjecture in order to create a viable argument	HSA-REI.A.1
Steps involved to when using inductive reasoning	HSA-REI.A.1
The multiple representations of numerical expressions and their role when working with radicals and integer exponents	8.EE.A.1
What it means to evaluate a function or expression	6.EE.A.1
The specific steps involved with the order of operations and how to appropriately apply them when using a calculator	6.EE.A.2

The multiple representations of variables and their role when applying and extending previous understandings of arithmetic to algebraic expressions	6.EE.A.2
The mathematical translation of an algebraic expression	6.EE.A.2
Definitions of variables	6.EE.A.2
Counterexamples of false mathematical statements	HSA-REI.A.1
Steps involved in simplifying expressions	7.EE.A.2
The components of equations and their multiple representations	6.EE.B.6
The components of open sentences and their mathematical translation	6.EE.A.2
The purpose of finding solutions of an equation and their multiple representations	6.EE.B.5
The appropriate labels for the axes of the coordinate system	6.NS.C.8 7.RP.A.2
The location of the y-axis	6.NS.C.8 7.RP.A.2
The appropriate labels for the axes of the coordinate plane	6.NS.C.8 7.RP.A.2
The origin is (0,0) on a coordinate plane	7.RP.A.2
The location of the x-axis	6.NS.C.8
Ordered pairs are written in the form (x,y) on a coordinate plane	7.RP.A.2
The graph of an equation in two variables is the set of all	HSA-REI.D.10

its solutions plotted in the coordinate plane	
A relation models the behavior between two quantities	8.F.B.4
Domain is the set of all possible x-values for an equation	HSF-IF.B.5 HSF-IF.A.1
Range is the set of all possible y-values for an equation	HSF-IF.A.1
Scatter plots represent data on two quantitative variables	HSS-ID.B.6
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to use a four-step plan to solve problems: explore plan, solve, examine	7.EE.B.3
How to choose an appropriate method of computation	7.NS.A.3
How to estimate an answer	8.EE.A.3
How to use the order of operations to evaluate expressions	6.EE.A.1
How to translate verbal phrases into numerical expressions	6.EE.A.2
How to evaluate expressions with numbers and variables	6.EE.A.2
How to identify and use properties of addition and multiplication to simplify algebraic expressions	6.EE.A.3
How to perform mental math	7.EE.B.3
How to find a counterexample	HSA-REI.A.1
How to identify and solve open sentences	6.EE.A.2
How to solve simple equations mentally	7.EE.B.3

	6.EE.B.5
How to identify properties of equality	HSA-REI.A.1
How to use ordered pairs to locate points	7.RP.A.2
How to use tables and graphs to represent relations	HSA-REI.D.10
How to graph each ordered pair on a coordinate system	HSA-REI.D.10
How to construct a scatter plot	HSS-ID.B.6
How to determine whether a scatter plot of data shows a positive, negative, or no relationship given a real world context	HSS-ID.B.6

Essential Outcomes - Upon completion of this course students will know (conceptual):

Alignment to Standards

Why it is helpful to use a problem-solving plan to solve problems	HSA-REI.A.1
What type of reasoning is used when making conclusions based on a pattern	HSA-REI.A.1
How to use an expression to solve a problem	HSA-REI.A.1
Why mathematicians need to agree on an order of operations	6.EE.A.2
How to use inductive reasoning	HSA-REI.A.1
Substitution Property of Equality	HSA-REI.A.1
How variables are used to show relationships	6.EE.A.2
Commutative Property of Addition	7.EE.B.3
Commutative Property of Multiplication	7.EE.B.3

Associative Property of Addition	7.EE.B.3
Associative Property of Multiplication	7.EE.B.3
Properties of Numbers	7.EE.B.3
Deductive reasoning	HSA-REI.A.1
How solving an open sentence is similar to evaluating an expression	6.EE.A.2
Properties of Equality: Symmetric and Transitive	HSA-REI.A.1
How ordered pairs are used to graph real-life data?	HSA-REI.D.10
How scatter plots can help spot trends	HSS-ID.B.6
How to interpret scatter plots	HSS-ID.B.6
Algebra is important because it can be used to show relationships among variables and numbers	HSA-CED.A.1
Resources Mini Unit 1A:	<p>Glencoe Mathematics Pre-Algebra Chapter 1</p> <p>Diagnostic for prerequisite skills p. 5</p> <p>Applications: Expressions and Spreadsheets p. 22, Scatter plots about height and arm span p. 39, Graphing Calculator Investigation about zoologists p. 45</p> <p>Study guide, review, practice tests p. 47-53</p> <p>Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 1)</p>

MINI UNIT 1B	
Title:	Integers and if time permits: Introductory Linear Algebra
Duration:	3 weeks
Overview:	Compare and order integers, finding absolute value, performing operations with integers, finding average, graphing and interpreting graphs, computing with matrices
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
A negative number can be written either rationally or irrationally	7.EE.B.3
An integer is a positive or negative whole number	7.EE.B.3
A coordinate is written in the form (x,y) on a coordinate plane	6.NS.C.8
Inequalities display the relationship between two quantities (numbers, variables, etc.)	6.EE.B.5
Absolute value represents the distance of a quantity from zero on the number line	6.NS.C.7
Opposites (Zero pairs) of numbers indicate locations on opposite sides of 0 on the number line	6.NS.C.6
When a number is subtracted from another number, it is the additive inverse when the equivalent operation is adding a negated number to another number ($p - q = p + (-q)$)	6.NS.C.6 7.NS.A.1
Average (mean) is equivalent to the sum of a set of numbers divided by the quantity of numbers in a set	6.SP.B.5
The locations and labels of the four quadrants on a	6.NS.C.8

coordinate plane	
Multiplication with matrices is not commutative unlike multiplication with all numbers and variables	HSN-VM.C.9
Zero and identity matrices have similar properties as 0 and 1 in the real number system	HSN-VM.C.10
Matrices can be transformed through multiplication since one matrix's values are being manipulated and resulting to a new output	HSN-VM.C.11
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to compare and order integers	6.NS.C.5
How to find the absolute value of an expression	6.NS.C.7
How to write integers for real-world situations	7.EE.B.3
How to find opposites (zero pair)	6.NS.C.6
How to evaluate expressions containing variables	6.EE.A.2
How to distribute the negative when evaluating expressions	7.NS.A.2
How to simplify algebraic expressions	6.EE.A.4
How to find the average of a set of data	6.SP.B.5
How to read parts of a division sentence and identify the dividend, divisor, and quotient	7.NS.A.2
How to graph points on a coordinate plane	7.RP.A.2
How to graph algebraic relationships	7.RP.A.2

How to write ordered pairs	7.RP.A.2
How to name quadrants	6.NS.C.8
How to calculate velocity using matrix operations	HSN-VM.A.3
How to add and subtract matrices	HSN-VM.A.2 HSN-VM.A.4
How to use scalar multiplication	HSN-VM.B.5
How to use matrices to manipulate data	HSN-VM.C.6
How to apply the zero matrix and identity matrix	HSN-VM.C.10
Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
How integers are used to model real-world situations	6.EE.B.6
How a number line can be a model to help add integers	6.NS.C.6
Additive Inverse Property	6.NS.C.6 7.NS.A.1
How addition and subtraction of integers are related	7.NS.A.1
How the signs of factors and products are related	6.NS.B.4
How is dividing integers related to multiplying integers	6.NB.3
How a coordinate system is used to locate places on Earth	7.RP.A.2
What parts of a coordinate plane do not lie in any quadrant	6.NS.C.8
Integers are used in many situations in both mathematics and everyday life including temperature,	7.EE.B.3

sports, and more	
Unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties	HSN-VM.C.9
The zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers	HSN-VM.C.10
A matrix summarizes a set of information presented as an array	HSN-VM.A.1
Resources Mini Unit 1B:	<p>Glencoe Mathematics Pre-Algebra Chapter 2 Diagnostic for prerequisite skills p. 55 Applications: Adding Integers with tiles p. 62, Reading Mathematics: Vocabulary p. 69 Study guide, review, practice tests p. 90-95 Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 2)</p> <p>If time permits:</p> <p>Big Ideas Algebra 2 textbook</p> <p>Khan Academy videos: https://www.khanacademy.org/math/precalculus/precalc-matrices/intro-to-matrices/v/introduction-to-the-matrix</p> <p>EdPuzzle differentiated videos</p>

MINI UNIT 1C	
Title:	Equations
Duration:	3 weeks

Overview:	Use the Distributive Property to simplify expressions, solve equations using the Properties of Equality, write and solve two-step equations, use formulas to solve real-world and geometry problems
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
Equivalent expressions can be rewritten using different representations but have equivalent meanings	7.EE.A.2 6.EE.A.4
Terms refer to letters that stand for numbers	6.EE.A.2
Coefficients are used when being placed next to a variable and acting as a multiple	6.EE.A.2
Like Terms are expressions using the same variable	8.EE.C.7
A term of an equation is called a constant when it is a number because it will not change	HSS-ID.C.7
Simplest form represents a completely simplified expression and can help make the solving process easier	7.EE.A.2
Simplifying an expression consists of combining like terms	7.EE.A.2
The types of inverse operations: additive and multiplicative	7.NS.A.1 6.EE.A.4
Equivalent equations can be rewritten using different representations but have equivalent meanings	7.EE.A.2
Two-step equations can be solved using two operations	HSA-REI.B.3
The definition of a formula	HSN-Q.A.1 7.G.B.4

Distance Formula can be used using the equation $d = rt$ where d is distance, r is rate, and t is time	6.EE.C.9
Area consists of the space inside a 2D figure	7.G.B.7
Perimeter consists of the length bordering a 2D figure	7.EE.B.4
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to use the Distributive Property to write equivalent numerical expressions	6.EE.A.3 6.NS.B.4
How to use the Distributive Property to write equivalent algebraic expressions	6.EE.A.3
How to use the Distributive Property to solve a problem	6.EE.A.3 8.EE.C.7
How to name operations that are combined using the Distributive Property	6.EE.A.3
How to use the Distributive Property, Addition Property, and Division Property to simplify algebraic expressions	6.EE.A.3
How to identify the terms, coefficients, and constants in the expression	HSA-REI.B.3
How to translate verbal phrases into expressions	6.EE.A.2
How to model and solve equations using algebra tiles	8.EE.C.7 HSA-REI.A.1
How to solve equations by using the Subtraction Property of Equality	HSA-REI.A.1
How to graph the solutions of an equation	HSA-REI.D.10

How to use an equation to solve a problem given a real-life context	7.EE.B.3
How to solve equations using the Multiplication of Equality	HSA-REI.A.1
How to solve two-step equations	HSA-REI.B.3
How to solve equations with negative coefficients	HSA-REI.B.3
How to combine like terms before solving	HSA-REI.B.3
How to translate verbal problems into equations	6.EE.A.2
How to write verbal sentences as two-step equations	HSA-REI.B.3
How to solve verbal problems by writing and solving two-step equations	HSA-REI.B.3
How to solve problems by using formulas	HSN-Q.A.1 7.G.B.4
How to solve problems using the perimeters and areas of rectangles	7.G.B.7 7.EE.B.4
How to find a missing length/width of a rectangle	7.EE.B.4
How to use technology to find perimeter and area (ex. spreadsheets, calculators)	7.G.B.7 7.EE.B.4
Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
How rectangles are related to the Distributive Property	8.EE.C.7
How algebraic tiles can be used to represent the simplification of algebraic expressions	HSA-REI.B.3

Addition, Subtraction, and Division Property of Equality	HSA-REI.A.1
How solving an equation is similar to keeping a scale in balance	HSA-REI.B.3
How equations are used to find the U.S. value of foreign currency	7.EE.B.3
Multiplication Property of Equality	HSA-REI.A.1
How algebra tiles can show the properties of equality	HSA-REI.A.1
How equations are used to solve real-world equations	7.EE.B.3
Why formulas are important in math and science	HSN-Q.A.1 7.G.B.4
Advantages of using a formula to show a relationship among quantities	HSN-Q.A.1 7.G.B.4
Although the length of a rectangle is usually greater than the width, it does not matter which side you choose to be the length	7.G.B.4
Resources Mini Unit 1C:	<p>Glencoe Mathematics Pre-Algebra Chapter 3</p> <p>Diagnostic for prerequisite skills p. 97</p> <p>Applications: Solving equations using tiles p. 108, Reading Mathematics: Translating Verbal Problems into Equations p. 125, Spreadsheet Investigation: Perimeter and Area p. 137</p> <p>Study guide, review, practice tests p. 138-145</p> <p>Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 3)</p>

UMBRELLA UNIT 2

Title: Algebra and Rational Numbers

Duration: 9 weeks

Essential Questions:

- What relationships exist between factors and multiples?
- What steps are involved when multiplying and dividing monomials?
- How can scientific notation help simplify analysis in real world applications?
- Why is scientific notation an important tool in comparing real-world data?
- Why are exponents important in computing computer data?
- How can models be used to determine whether numbers are prime?
- How can a diagram be used to find the greatest common factor?
- How are simplified fractions useful in representing measurements?
- How are powers of monomials useful in comparing earthquake magnitudes?
- How do negative exponents represent repeated division?
- How can rational numbers be rewritten using different representations?
- How are rational numbers related to other sets of numbers?
- Why are fractions important when taking measurements?
- How can you use prime factors to find the least common multiple?
- What steps are involved when adding, subtracting, multiplying, and dividing rational numbers?

	<p>How can the least common denominator help compare fractions and help solve equations?</p> <p>How are measures of central tendency used in the real world?</p> <p>How do geometric sequences help predict quantities?</p> <p>How are ratios and proportions used in real world applications?</p> <p>How are scale drawings used in everyday life?</p> <p>How are percents related to fractions and decimals?</p> <p>How are percents important in real-world situations?</p>
Summative Assessments: (Assessment at the end the learning period)	<p>Chapter tests with open ended questions and short answer questions</p> <p>Projects involving real-world applications</p>
Formative Assessments: (Ongoing assessments during the learning period)	<p>Glencoe online quizzes, textbook practice problems by section, quizzes periodically on subtopics</p>
Differentiation	<p>EdPuzzle Flipped Classroom activities, Khan Academy for reinforcement and/or Flipped Classroom (https://www.khanacademy.org/math/algebra-home/pre-algebra#table-of-contents), Student choice for projects involving real-world applications, Student choice for reinforcement activities from Glencoe's website</p>
TECHNOLOGY STANDARD (STANDARD 8)	
CPI #	CUMULATIVE PROGRESS INDICATOR (CPI)
8.1.8.A.4	Generate a spreadsheet to calculate, graph and present information.

8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
8.2.8.B.3	Solve a science-based design challenge and build a prototype using science and math principles throughout the design process.
8.2.8.D.1	Evaluate the role of ethics and bias on trend analysis and prediction in the development of a product that impacts communities in the United States and / or other countries.
21ST CENTURY LIFE AND CAREER (STANDARD 9)	
CPI #	CUMULATIVE PROGRESS INDICATOR (CPI)
9.1.8.A.6	Explain how income affects spending decisions.
9.1.8.D.4	Distinguish between income and investment growth.
9.1.8.E.5	Analyze interest rates and fees associated with financial services, credit cards, debit cards, and gift cards.
9.3.12.FN.1	Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision making in the finance industry.
9.3.ST.2	Use technology to acquire, manipulate, analyze and report data.
9.3.ST-ET.2	Display and communicate STEM information.
9.3.ST-ET.3	Apply processes and concepts for the use of technological tools in STEM.
9.3.ST-ET.5	Apply the knowledge learned in STEM to solve problems.
9.3.ST-SM.3	Analyze the impact that science and mathematics has on society.
9.3.ST-SM.4	Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data

MINI UNIT 2A	
Title:	Factors and Fractions
Duration:	3 weeks
Overview:	Identify and perform operations with monomials, evaluate expressions with exponents, factor expressions using the greatest common factor, and using scientific notation
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
Efficient methods to find factors of numbers and expressions	6.NS.B.4
Divisibility rules relating to factors and multiples	6.NS.B.4
A monomial is an expression with one term	6.EE.A.2
A base is multiplied by itself during exponentiation	8.EE.A.3
The applications of exponents when applying and extending previous understandings of arithmetic to algebraic expressions	6.EE.A.1
Powers can be used to express very large and very small numbers	8.EE.A.3
Standard form is commonly used to help make factoring, solving, and simplifying easier processes	HSA-APR.A.1
Expanded form separates like terms of polynomials	HSA-APR.A.1
Prime numbers are numbers that are only divisible by 1 and itself	4.OA.B.4
Composite numbers are numbers that have factors in addition to 1 and itself	4.OA.B.4

Prime factorization consists of finding which prime numbers multiply together to make the original number	4.OA.B.4
Efficient methods using factor trees in order to gain familiarity with factors and multiples	4.OA.B.4
Multiple representations of probability events using venn diagrams	7.SP.C.8
Greatest common factors of whole numbers less than or equal to 100	6.NS.B.4
Benefits of rewriting terms in simplest form	7.EE.A.1
Algebraic fractions can be used to analyze proportional relationships	7.RP.A.1
Applications of negative exponents when simplifying expressions	8.EE.A.1
Scientific notation can be used to efficiently rewrite very small or very large numbers	8.EE.A.4
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to determine whether one number is a factor of another	6.NS.B.4
How to determine whether an expression is a monomial	6.EE.A.2
How to use divisibility rules to solve a problem	7.NS.A.2
How to write and evaluate expressions using exponents	6.EE.A.1
How to use exponents in expanded form	6.EE.A.2

How to write the prime factorization of composite numbers	4.OA.B.4
How to factor monomials	7.EE.A.1
How to identify numbers as prime or composite	4.OA.B.4
How to write prime factorization using a factor tree	4.OA.B.4
How to find the greatest common factor of two or more numbers or monomials	6.NS.B.4
How to use the Distributive Property to factor algebraic expressions	7.EE.A.1
How to simplify fractions using the greatest common factor	6.NS.B.4
How to simplify algebraic fractions	7.EE.A.1
How to simplify fractions in measurement	7.RP.A.1
How to translate words such as “squared” into powers and algebraic expressions	6.EE.A.2
How to multiply, divide, and subtract monomials	HSA-APR.A.1
How to divide powers to solve a problem	HSA-APR.A.1
How to apply exponents when calculating for half-lives	8.EE.A.3
How to write expressions using negative exponents	8.EE.A.1
How to evaluate numerical expressions containing negative exponents	8.EE.A.1
How to express numbers in standard form and in scientific notation	8.EE.A.4

How to compare and order numbers written in scientific notation	8.EE.A.4
Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
How side lengths of rectangles are related to factors	7.RP.A.1
Why exponents are important in comparing computer data	8.EE.A.4
Since powers are forms of multiplication, they need to be included in the rules for order of operation	8.EE.A.4 6.EE.A.2
Fractions can be used to analyze and compare data in the real world	7.NS.A.3
The order of factors does not matter because the operation of multiplication is commutative	7.EE.B.3
How models can be used to determine whether numbers are prime	4.OA.B.4
How a diagram can be used to find the greatest common factor	6.NS.B.4
How the Quotient of Powers property is related to subtracting exponents	7.NS.A.2
How powers of monomials are useful in comparing earthquake magnitudes	7.NS.A.2
A radioactive material such as uranium decomposes or decays in a regular manner best described as a half-life	7.NS.A.2
How do negative exponents represent repeated division	8.EE.A.1

Why scientific notation is an important tool in comparing real-world data	8.EE.A.4
Resources Mini Unit 2A:	Glencoe Mathematics Pre-Algebra Chapter 4 Diagnostic for prerequisite skills p. 147 Applications: Binary Activity p. 158, Reading Mathematics: Powers Activity p. 174, Half-Life Simulation p. 180 Study guide, review, practice tests p. 191-197 Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 4)

MINI UNIT 2B	
Title:	Rational Numbers
Duration:	3 weeks
Overview:	Convert fractions and decimals, perform operations with rational numbers, use the least common denominator to compare fractions and solve equations, use the mean, median, and mode to analyze data, and find the terms of arithmetic and geometric sequences
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
Whether a specified terminating decimal is rational or irrational	5.NBT.A.3
Multiple representations of a mixed number	4.NF.B.3
The purpose of using bar notation when writing decimals	5.NBT.A.3
The purpose of using decimal points to differentiate between tenths, hundredths, etc.	5.NBT.A.3

A rational number as a point on the number line	6.NS.C.6
Applications of dimensional analysis when converting units	7.RP.A.2
Multiplicative inverses of numbers or reciprocals of numbers	7.NS.A.2
Multiples, common multiples, and least common multiples of numbers less than or equal to 100	6.NS.B.4
Methods to find least common denominators	5.NF.A.1
Measures of central tendency: mean, median, mode	6.SP.B.5
Patterns found from sequences	HSF-IF.A.3
Strategies to detect when sequences are arithmetic	HSF-BF.A.2
Notation to differentiate between nth terms of sequences	HSF-BF.A.2
Common differences between terms of sequences	HSF-BF.A.2
Strategies to detect when sequences are geometric	HSF-BF.A.2
Strategies to detect common ratios of geometric sequences	HSF-BF.A.2
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to write fractions as terminating or repeating decimals	5.NBT.A.3
How to compare fractions and decimals	4.NF.C.7
How to write a mixed number as a decimal	5.NF.B.6

How to write rational numbers as fractions	HSA-APR.D.7
How to identify and classify rational numbers	8.NS.A.2
How to write terminating decimals as fractions	5.NBT.A.3
How to write repeating decimals as fractions	5.NBT.A.3
How to multiply fractions	7.NS.A.3
How to use dimensional analysis to solve problems	7.RP.A.1
How to divide fractions using the multiplicative inverse	7.NS.A.3
How to find the multiplicative inverse	7.NS.A.3
How to add and subtract like fractions and mixed numbers	7.NS.A.3
How to find the least common multiple of two or more numbers	6.NS.B.4
How to find the least common denominator of two or more fractions	6.NS.B.4
How to compare fractions using the least common denominator	6.NS.B.4
How to add and subtract unlike fractions	7.NS.A.3 5.NF.A.1
How to analyze data using spreadsheets	HSS-ID.A.4
How to use the mean, median, and mode as measures of central tendency	6.SP.B.5
How to analyze data using mean, median, and mode	6.SP.B.5
How to use a line plot	5.MD.B.2

How to find extreme values that affect the mean	HSS-ID.A.3
How to find an individual quantity given the mean, total number of quantities, and working backwards	HSS-MD.A.2
How to find the mean and median using a graphing calculator	HSS-ID.A.4
How to solve equations containing rational numbers	HSA-REI.A.2
How to identify and find the terms of arithmetic sequences	HSF-BF.A.2
How to identify and find the terms of geometric sequences	HSF-BF.A.2
How to identify and find terms using the Fibonacci sequence	HSF-IF.A.3
Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
How fractions were used to determine the size of the first coins	7.EE.B.3
How rational numbers are related to other sets of numbers	6.NS.C.7
Why any integer n is a rational number	6.NS.C.6
How multiplying fractions is related to areas of rectangles	7.G.B.6
How dividing by a fraction is related to multiplying	5.NF.B.3
Inverse Property of Multiplication	5.NF.B.5
Why fractions are important when taking	5.NF.B.6

measurements	
The rule for subtracting fractions with like denominators similar to the rule for adding fractions with like denominators	5.NF.A.2
How prime factors can be used to find the least common multiple	6.NS.B.4
How can the least common multiple be used to add and subtract fractions with denominators	6.NS.B.4
How measures of central tendency are used in the real world	HSS-ID.A.4
How sequences can be used to make predictions	HSF-BF.A.2
Resources Mini Unit 2B:	<p>Glencoe Mathematics Pre-Algebra Chapter 5 Diagnostic for prerequisite skills p. 199 Applications: Reading Mathematics: Factors and Multiples Game: Juniper Green p. 231, Analyzing data with spreadsheets p. 237, Graphing Calculator Investigation: Mean and Median p. 243, Fibonacci Sequence p. 253 Study guide, review, practice tests p. 254-261 Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 5)</p>

MINI UNIT 2C	
Title:	Ratio, Proportion, and Percent
Duration:	3 weeks
Overview:	Write ratios as fractions, find unit rates, solve problems using scale drawings, convert decimals, fractions, and percents, calculate probabilities
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards

The definition of a ratio in terms of a part over a whole	7.EE.B.3
The definition of rate as a quantity measured against another measure	6.RP.A.3
The definition of a unit rate as a comparison of two different quantities when they are combined together	6.RP.A.3 7.RP.A.1
Methods involving proportion using a part considered in comparative relation to a whole	7.RP.A.2
Whether two quantities are in a proportional relationship using cross products	7.RP.A.2
Benefits of using scale drawings/models to determine proportional relationships	7.G.A.1
The properties of dilations given by a center and a scale factor	HSG-SRT.A.1
The definition of percent as one part in every hundred	7.RP.A.3
Percent proportion in terms of parts and bases	7.RP.A.3
Methods to solve for percents using equations	7.RP.A.3
Applications such as discounts using percents	7.EE.B.4
Simple and compound interest formulas and applications	HSA-SSE.B.3
The definition of percent of change as the extent to which a variable gains or loses intensity, magnitude, extent, or value	6.RP.A.3
Percent change can be represented as increase and decrease	6.RP.A.3

Outcomes of given probability events	HSS-CP.A.1
Simple events are subsets of a sample space using characteristics of outcomes	HSS-CP.A.1
Definitions of probability (Theoretical and experimental)	HSS-MD.B.6
The definition of sample space as the set of possible outcomes	HSS-CP.A.1
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to write ratios as fractions in simplest form	7.EE.B.3
How to determine unit rates	6.RP.A.3 7.RP.A.1
How to convert rates/measurements	HSN-Q.A.3
How to compare rates by reading texts and spreadsheets	6.RP.A.3
How to solve proportions (given a real world context)	7.RP.A.3
How to collect data and identify/find proportions	7.RP.A.3 6.SP.A.2
How to use and construct scale drawings	7.G.A.1
How to find actual measurements using scale	HSN-Q.A.3
How to covert between percents, fractions, and decimals	5.NBT.A.3
How to use the percent proportion to solve problems	7.RP.A.3
How to find the part and base if a percent proportion	7.RP.A.3

How to compute mentally and estimate with percents	7.RP.A.3
How to solve numerical and applied percent problems	7.RP.A.3
How to find simple and compound interest (using spreadsheets)	HSA-SSE.B.3
Find percent of increase and decrease	7.RP.A.3
How to take a survey of an unbiased and random sample	7.SP.A.2
How to find the probability of simple events	7.SP.C.5
How to use a sample to predict the actions of a larger group	7.SP.C.6
How to simulate random numbers with a graphing calculator	HSS-MD.B.6
Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
How ratios are used in paint mixtures	7.RP.A.3
How are proportions used in recipes	7.RP.A.3
How scale drawings are used in everyday life	7.G.A.1
How percents are related to fractions and decimals	5.NBT.A.3
How percents are important in real-world situations	5.NBT.A.3
How estimation is used when determining sale prices	7.EE.B.3
How the percent proportion is related to an equation	7.RP.A.3
How percents can help describe a change in area	7.G.A.1

How probability can help make predictions	HSS-MD.B.6 7.SP.C.6
Resources Mini Unit 2C:	Glencoe Mathematics Pre-Algebra Chapter 6 Diagnostic for prerequisite skills p. 263 Applications: Reading Mathematics: Reading Mathematics: Comparing Ratios p. 269, Activity: Collecting data and finding ratios p. 275, Using a Percent Model p. 286-287, Spreadsheet Investigation: Compound Interest p. 303, Taking a Survey p. 309, Graphing Calculator Investigation: Probability Simulation p. 315 Study guide, review, practice tests p. 316-323 Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 6)

UMBRELLA UNIT 3

Title: Linear Equations, Inequalities, and Functions

Duration: 9 weeks

Essential Questions:

- What key words in a statements express equality?
- How is solving equations with variables on each side like solving equations with variables on one side?
- Why is the Distributive Property important in solving equations?
- How can inequalities help describe relationships?
- How is solving an inequality similar to solving an equation?
- How are inequalities used in study fields in STEM?
- How can the relationship between real world applications such as actual temperatures and windchill temperatures be a function?
- How can linear equations represent a function?
- How can intercepts be used to represent a real-life function?
- How can slope be used to describe roller coasters and other real world applications?
- How are slope and speed related?
- How can knowing the slope and y-intercept help you graph an equation?
- How can you model data with a linear equation?
- How can a line be used to predict life expectancy to future generations?

	<p>How can a system of equations be used to compare data?</p> <p>How can shaded regions on a graph model inequalities?</p> <p>How are polynomials used to approximate real-world data?</p> <p>How can you use algebra tiles to add and subtract polynomials?</p> <p>How is subtracting polynomials similar to subtracting measurements?</p> <p>How is the Distributive Property used to multiply a polynomial by a monomial?</p> <p>How can you determine whether a function is linear?</p> <p>How are functions, formulas, tables, and graphs related?</p>
Summative Assessments: (Assessment at the end the learning period)	<p>Chapter tests with open ended questions and short answer questions</p> <p>Projects involving real-world applications</p>
Formative Assessments: (Ongoing assessments during the learning period)	<p>Glencoe online quizzes, textbook practice problems by section, quizzes periodically on subtopics</p>
Differentiation	<p>EdPuzzle Flipped Classroom activities, Khan Academy for reinforcement and/or Flipped Classroom (https://www.khanacademy.org/math/algebra-home/pre-algebra#table-of-contents), Student choice for projects involving real-world applications, Student choice for reinforcement activities from Glencoe's website</p>
TECHNOLOGY STANDARD (STANDARD 8)	
CPI #	CUMULATIVE PROGRESS INDICATOR (CPI)

8.1.8.A.4	Generate a spreadsheet to calculate, graph and present information.
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
8.2.8.B.3	Solve a science-based design challenge and build a prototype using science and math principles throughout the design process.
8.2.8.D.1	Evaluate the role of ethics and bias on trend analysis and prediction in the development of a product that impacts communities in the United States and / or other countries.
21ST CENTURY LIFE AND CAREER (STANDARD 9)	
CPI #	CUMULATIVE PROGRESS INDICATOR (CPI)
9.1.8.A.6	Explain how income affects spending decisions.
9.1.8.D.4	Distinguish between income and investment growth.
9.1.8.E.5	Analyze interest rates and fees associated with financial services, credit cards, debit cards, and gift cards.
9.3.12.FN.1	Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision making in the finance industry.
9.3.ST.2	Use technology to acquire, manipulate, analyze and report data.
9.3.ST-ET.2	Display and communicate STEM information.
9.3.ST-ET.3	Apply processes and concepts for the use of technological tools in STEM.
9.3.ST-ET.5	Apply the knowledge learned in STEM to solve problems.
9.3.ST-SM.3	Analyze the impact that science and mathematics has on society.
9.3.ST-SM.4	Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data

MINI UNIT 3A	
Title:	Linear Equations, Inequalities, and Functions
Duration:	3 weeks
Overview:	Solving equations and inequalities and graphing inequalities
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
Null or empty sets result from no solution when solving equations	8.EE.C.8
When the Identity Property is being applied when solving equations	8.EE.C.8
Types of inequalities and how they describe relationships between quantities	HSA-CED.A.1 HSA-CED.A.3
Linear equations can be used to illustrate slope and intercepts	8.EE.C.8
The = symbol of an equation represents equality between different quantities	HSA-CED.A.1
Solving techniques for linear equations and inequalities	HSA-REI.B.3
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to solve equations with variables on each side	HSA-REI.B.3
How to use tiles/manipulatives to solve equations	HSA-REI.B.3
How to solve equations that involve grouping symbols	8.EE.C.7

How to identify equations that have no solution or an infinite number of solutions	8.EE.C.8
How to translate meanings of “at most” and “at least” when writing inequalities	HSA-CED.A.3
How to write and graph inequalities	6.EE.B.8 HSA-CED.A.1
How to determine the truth of an inequality	HSA-CED.A.1 HSA-CED.A.3
How to solve an inequality given a real-world context	6.EE.B.6 HSA-CED.A.1 HSA-CED.A.3
Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
How solving equations with variables on each side is like solving equations with one side	HSA-REI.B.3
Which property allows you to add the same property to each side of an equation	HSA-REI.A.1
Why the Distributive Property is important in solving equations	8.EE.C.7
How inequalities can describe relationships	HSA-CED.A.1 HSA-CED.A.3
Which symbols are used to write inequalities and what they mean	HSA-CED.A.1 HSA-CED.A.3
How to understand solving an equality is a process of answering a question about a specified set	6.EE.B.5

Resources Mini Unit 3A:	<p>Glencoe Mathematics Pre-Algebra Chapter 7</p> <p>Diagnostic for prerequisite skills p. 327</p> <p>Applications: Activity: Webquest about equations p. 325, Solving equations with variables on both sides using tiles/manipulatives p. 328-329, Reading Mathematics: Meanings of “At Most” and “At least” p. 339</p> <p>Study guide, review, practice tests p. 360-365</p> <p>Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 7)</p>
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MINI UNIT 3B	
Title:	Functions and Graphing
Duration:	5 weeks
Overview:	Using functions to describe relationships between two quantities, write linear equations using ordered pairs, intercepts, and slope, finding slope, using best-fit lines to make predictions about data, solving systems of equations and inequalities
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
Inputs and outputs represent appropriate x and y values for a function respectively	8.F.A.1
A function is a rule that assigns to each output exactly one output	8.F.A.1
Vertical Line Tests assesses whether an equation is a function	HSF-IF.B.4
Domain and range represents possible x and y values for a function respectively	HSF-IF.A.1
Relations between two or more quantities are	8.F.A.1

described by equations or inequalities	
Distance as a function of time	7.RP.A.1
Multiple representations of solutions: roots, intercepts, zeros using numbers, tables, and graphs	HSA-REI.B.3
The definition of function notation $f(x)$ for any real number x	HSF-IF.A.2
Multiple representations of an x-intercept and y-intercept	HSF-IF.C.7
Multiple representations of slope using equations and graphs	HSS-ID.C.7
Rate of change is described using slope	HSS-ID.C.7
Direct variation represents a quantity being multiplied by a constant	HSS-ID.C.7
The equation for slope-intercept form	8.F.A.3
Multiple representations of algebraic representations: equation, table, graph	HSA-REI.D.11
The purpose of using best-fit lines	HSA-REI.C.6
Applications of systems of equations and various methods to solve for multiple variables	HSA-REI.C.5
Methods for substitution and the definition of evaluating	HSA-REI.C.5
Algebraic and graphical definitions of boundaries when solving inequalities	HSA-REI.D.12
Half planes display graphical solutions to linear	HSA-REI.D.12

inequalities in two variables	
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to determine whether relations are functions	HSF-IF.A.1
How to interpret the equation $y=mx+b$ as defining a linear functions, whose graph is a straight line	8.F.A.3
How to use functions to describe relationships between two quantities	HSA-CED.A.2
How to use ordered pairs and tables as functions	8.F.B.4
How to use a graph to identify functions	HSF-IF.B.4
How to use a function to describe data	HSF-IF.B.4
How to use function tables on a graphing calculator	HSA-REI.D.11 HSA-IF.C.7
How to solve linear equations with two variables	HSA-REI.B.5
How to graph linear equations using ordered pairs	8.F.B.4
How to read functional notation	HSF-IF.A.2
How to find the x-intercept and y-intercept	HSA-CED.A.2
How to graph linear equations using the x- and y-intercepts	HSA-CED.A.2
How to interpret intercepts from real-world data	HSA-CED.A.2 HSF-IF.B.4
How to determine if an intercept is horizontal or vertical	HSA-CED.A.2

How to find the slope of a line	HSS-ID.C.7
How to use rise and run to find slope	HSS-ID.C.7
How to determine if there is a positive, negative, or no slope	HSS-ID.C.7
How to determine if slope is undefined	HSS-ID.C.7
How to compare slopes of real world applications	HSS-ID.C.7 8.F.A.2
How to find and compare rates of change	HSS-ID.C.7 8.F.A.2
How to solve problems involving direct variation	HSS-ID.C.7
How to determine slopes and y-intercepts of lines	HSS-ID.C.7 HSA-CED.A.2
How to graph linear equations using the slope and y-intercept	HSS-ID.C.7 HSA-CED.A.2
How to write an equation in slope-intercept form	8.F.A.3
How to graph an equation to solve a problem	HSA-CED.A.2
How to compare families of graphs using a graphing calculator	8.F.A.2
How to write equations given the slope, y-intercept, a graph, a table, or two points	HSA-REI.D.11
How to draw best-fit lines for sets of data	HSA-REI.C.6
How to use best-fit lines to make predictions about real-life data	HSA-REI.C.6

How to solve systems of linear equations by graphing	HSA-REI.C.6
How to solve systems of equations by substitution	HSA-REI.C.5
How to determine if a system of equations has no solution, infinitely many solutions, or one solution	HSA-REI.D.11
How to graph linear inequalities	HSA-CED.A.3
How to describe solutions of linear inequalities	HSA-REI.B.3 HSA-REI.D.11
How to write and graph an inequality to solve a real-world problem	HSA-CED.A.1 HSA-CED.A.3
How to graph inequalities using a graphing calculator	HSA-REI.D.11
Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
A function is a rule that assigns to each input exactly one output	8.F.A.1
A function from one set (called the domain) to another set (called the range) assigns each element of the domain exactly one element of the range	HSF-IF.A.1
How the relationship between various temperatures can be a function	HSF-IF.B.4
How linear equations can represent a function	8.F.A.1
How intercepts can be used to represent real-life information	HSA-CED.A.2 HSF-IF.B.4

The ordered pairs of any two solutions can be used to graph a linear equation, but it is often easiest to find the intercept	HSF-IF.B.4 HSA-CED.A.3
How slope is used to describe roller coasters and other real-life examples	HSS-ID.C.7
How slope and speed are related	HSS-ID.C.7
The relationship between slope and rate of change	HSS-ID.C.7
The slope and y-intercept can help you graph an equation	HSA-CED.A.3
Relationships between families of graphs	HSF-IF.C.9
How a linear equation can model real-life data	HSA-CED.A.3
A line can be used to predict life expectancy for future generations	8.F.A.3-4-5
Using estimation, it is possible to draw different lines to approximate the same data	8.F.A.3-4-5
How a system of equations can be used to compare real-life data	HSF-IF.C.9
The number of solutions of a system of equations can be determined by slopes and y-intercepts of the existing lines	HSA-REI.B.3 HSA-REI.D.11
It is possible to have both whole number and decimal solutions in the shaded region of an inequality	HSA-REI.B.3 HSA-REI.D.11
Resources Mini Unit 3B:	Glencoe Mathematics Pre-Algebra Chapter 8 Diagnostic for prerequisite skills p. 367 Applications: Graphing Calculator Investigation: Function Tables p. 374, Reading Mathematics:

	<p>Language of Functions p. 380, Activity: Slope of a hill p. 386, Activity: Collecting data about rate of change p. 392, Graphing Calculator Investigation: Families of Graphs p. 402-403, Graphing Calculator Investigation: Graphing Inequalities p. 423</p> <p>Study guide, review, practice tests p. 424-431</p> <p>Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 8)</p>
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MINI UNIT 3C	
Title:	Polynomials and Nonlinear Functions
Duration:	2 weeks
Overview:	Identifying and classifying polynomials, adding, subtracting, and multiplying polynomials, determining whether functions are linear or nonlinear, exploring different representations of quadratic and cubic functions
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
Polynomials consist of terms, coefficients, and exponents	HSA-APR.A.1
Polynomials form a system analogous to the integers and closed under addition, subtraction, and multiplication	HSA-APR.A.1
The relationship between the prefixes of binomial/trinomial and the number of terms present	HSA-APR.A.1
The degree of a polynomial is the highest exponent when comparing the exponent of each term	HSA-APR.A.1
A graph can be described as linear or nonlinear based on its relationship between two quantities	8.F.B.5
A function can be described as quadratic based on its	HSF-IF.C.7

degree of 2, its curved U-shape, and its algebraic properties	
A function can be described as cubic based on its degree of 3, its snake-like shape, and its algebraic properties	HSF-IF.C.7
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to identify and classify polynomials	HSA-APR.A.1
How to find the degree of a (real-world) polynomial	HSA-APR.A.1
How to model polynomials with algebra tiles	HSA-APR.A.1
How to add, subtract, and multiply polynomials	HSA-APR.A.1
How to subtract polynomials using the additive inverse	HSA-APR.A.1
How to multiply a monomial and a polynomial	HSA-APR.A.1
How to use operations with polynomials to solve a real-world problem	HSA-APR.A.1
How to determine whether a function is linear or nonlinear	HSF-IF.C.7
How to identify functions using graphs, equations, and tables	HSF-IF.C.7
How to graph quadratic and cubic functions using tables, equations, and graphing calculators	HSF-IF.C.7

Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
How polynomials are used to approximate real-world data	HSA-APR.A.1
How algebra tiles can be used to add polynomials	HSA-APR.A.1
How subtracting polynomials is similar to subtracting measurements	HSA-APR.A.1
How the Distributive Property is used to multiply a polynomial by a monomial	HSA-APR.A.1
How to determine whether a function is linear	7.G.B.6
How functions, formulas, tables, and graphs are related	7.G.B.6
Resources Mini Unit 3C:	<p>Glencoe Mathematics Pre-Algebra Chapter 13 Diagnostic for prerequisite skills p. 667 Applications: Reading Mathematics: Prefixed and Polynomials p. 668, Activity: Modeling Polynomials with Algebra Tiles p. 673, Activity: Modeling Multiplication p. 682, Graphing Calculator Investigation: Families of Quadratic Functions p. 697 Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 13)</p>

UMBRELLA UNIT 4

Title: Applying Algebra to Geometry, Probability, and Statistics

Duration: 9 weeks

Essential Questions:

- How are square roots related to factors?
- How can squares have lengths that are not rational numbers?
- How are angles used in circle graphs?
- How do the angles of a triangle relate to each other?
- How do the sides of a right triangle relate to each other?
- How is the Distance Formula related to the Pythagorean Theorem?
- How can similar triangles be used to create patterns?
- How are ratios in right triangles used in the real world?
- How are parallel lines and angles related?
- Where are congruent triangles present in nature?
- How are transformations involved in recreational activities?
- How are quadrilaterals used in design?
- How is the area of a parallelogram related to the area of a rectangle?
- How are polygons used in tessellations?
- How are circumference and diameter related?

How can polygons help to find the area of an irregular figure?

How are 2-dimensional figures related to 3-dimensional figures?

How is volume related to area?

How is the volume of a pyramid related to the volume of a prism?

How is the surface area of a solid different from its volume?

How is surface area important in architecture?

How can linear dimensions be used to identify similar solids?

Why are all measurements really approximations?

How can stem-and-leaf plots help you understand an election?

Why are measures of variation important in interpreting data?

How can box-and-whisker plots help you interpret data?

How are histograms similar to frequency tables?

How can graphs be misleading?

How can you count different types of possible outcomes from multiple scenarios?

Why is order sometimes important when determining outcomes?

How are odds related to probability?

How are compound events related to simple events?

Summative Assessments: (Assessment at the end the learning period)	Chapter tests with open ended questions and short answer questions Projects involving real-world applications
Formative Assessments: (Ongoing assessments during the learning period)	Glencoe online quizzes, textbook practice problems by section, quizzes periodically on subtopics
Differentiation :	EdPuzzle Flipped Classroom activities, Khan Academy for reinforcement and/or Flipped Classroom (https://www.khanacademy.org/math/algebra-home/pre-algebra#table-of-contents), Student choice for projects involving real-world applications, Student choice for reinforcement activities from Glencoe's website Geoboards (located in Room 214) for kinesthetic and dynamic exploration of polygons
TECHNOLOGY STANDARD (STANDARD 8)	
CPI #	CUMULATIVE PROGRESS INDICATOR (CPI)
8.1.8.A.4	Generate a spreadsheet to calculate, graph and present information.
8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
21ST CENTURY LIFE AND CAREER (STANDARD 9)	
CPI #	CUMULATIVE PROGRESS INDICATOR (CPI)
9.3.ST.2	Use technology to acquire, manipulate, analyze and report data.
9.3.ST-ET.2	Display and communicate STEM information.
9.3.ST-ET.3	Apply processes and concepts for the use of technological tools in STEM.
9.3.ST-ET.5	Apply the knowledge learned in STEM to solve problems.

9.3.ST-SM.3	Analyze the impact that science and mathematics has on society.
9.3.ST-SM.4	Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data

MINI UNIT 4A	
Title:	Real Numbers and Right Triangles
Duration:	4 weeks
Overview:	Finding square roots, identifying numbers in the real number system, classifying angles, finding missing angle measures in triangles, using the Pythagorean Theorem, Distance Formula, and Midpoint Formula, identifying similar figures, and solving problems using trigonometric ratios
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
The definition of perfect squares and existing perfect squares from 0 to 225	8.EE.A.2
The definition of square roots and its relationship to perfect squares	8.EE.A.2
Radical notation when writing nth roots	8.EE.A.2
The definition of an irrational number and the location of a specified irrational number on a number line	8.NS.A.1
Real numbers include all existing quantities except imaginary numbers	HSS-ID.A.1
The definition, notation, and visual representation of a point, line, line segment, and angle	HSG-CO.A.1

The definition of an angle, notation for an angle, and its visual representation	HSG-CO.A.1
The definition of a vertex and its location on a polygon	HSG-CO.B.7
The relationship between sides of polygons and its area and perimeter	HSG-CO.B.7
Notation and definition of a degree in terms of angle measure	HSG-CO.B.7
The purpose of using a protractor in geometry	HSG-CO.D.12
Definitions of acute, right, obtuse, and straight angles	HSG-CO.A.1
Definitions of various types of triangles (Acute, obtuse, right, scalene, isosceles, equilateral)	HSG-CO.C.10
The definition of congruency and its notation	HSG-CO.C.9
The definition of equiangular and how to display this relationship algebraically	HSG-CO.C.9
The Pythagorean Theorem	HSG-SRT.C.6 8.G.B.7
Pythagorean triples	HSG-SRT.C.6 8.G.B.7
Legs of a right triangle and their relationship when a triangle is isosceles	HSG-SRT.C.6 8.G.B.7
The hypotenuse of a right triangle is always the largest side	HSG-SRT.C.6 8.G.B.7
Steps of solving a right triangle	HSG-SRT.B.5
Converse of the Pythagorean Theorem	HSG-SRT.C.8

	8.G.B.6
The Distance Formula	8.G.B.8
Midpoints and The Midpoint Formula	HSN-CN.B.6
Similar triangles and its relationship to scale factor	HSG-SRT.A.2
Applications of indirect measurement	8.G.B.8
Trigonometric ratios: sine, cosine, tangent	HSG-SRT.C.6-7
Methods involving inverse trigonometric and finding missing angle measures	HSG-SRT.C.6-7
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to find squares and square roots	8.EE.A.2
How to estimate square roots	8.EE.A.2
How to use square roots to solve real-world problems	8.EE.A.2
How to identify and compare numbers in the real number system (on a number line)	HSS-ID.A.1
How to solve equations by finding square roots	HSA-REI.B.4
How to classify real numbers	HSS-ID.A.1
How to measure and draw angles (using a protractor)	HSG-CO.D.12
How to classify angles as acute, right, obtuse, or straight	HSG-CO.C.10
How to use angles to solve real-world problems	HSG-CO.C.10
How to create circle graphs and spreadsheets using	HSS-ID.A.4

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How to find the missing angle measure of a triangle	HSG-SRT.C.6-7
How to classify triangles by angles and by sides	HSG-CO.B.8
How to use ratios to find angle measures	HSG-SRT.C.6-7
How to apply the Pythagorean Theorem to find missing sides of a right triangle	HSG-SRT.C.8 8.G.B.6
How to use the Pythagorean Theorem to find the length of a side of a right triangle	HSG-SRT.C.6 8.G.B.7
How to use the converse of the Pythagorean Theorem to determine whether a triangle is a right triangle	HSG-SRT.C.8 8.G.B.6
How to solve a right triangle	HSG-SRT.B.5
How to graph irrational numbers on a number line	HSS-ID.A.1 8.EE.A.2
How to use the Distance Formula to determine lengths on a coordinate plane	8.G.B.8
How to use the Midpoint Formula to find the midpoint of a line segment on the coordinate plane	HSN-CN.B.6
How to identify corresponding parts and finding missing measures of similar triangles	HSG-SRT.C.6-7
How to solve problems involving indirect measurement using similar triangles	HSG-SRT.A.2
How to use shadow reckoning	HSG-SRT.A.2
How to label angles, lines, rays, and triangles using letter notation	HSG-CO.A.1

How to find sine, cosine, and tangent ratios	HSG-SRT.C.6-7
How to solve problems by using the trigonometric ratios	HSG-SRT.C.6-7
How to use a calculator to find trigonometric ratios	HSG-SRT.C.6-7
How to find missing angles of a right triangle	HSG-SRT.C.6-7
Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
How square roots are related to factors	8.EE.A.2
What the radical sign indicates	8.EE.A.2
How squares have lengths that are not rational numbers	8.EE.A.2
How to form relationships between the everyday meaning of geometric vocabulary and its mathematical meaning	HSG-CO.A.1
How angles are used in circle graphs	HSG-CO.A.1
How angles of a triangle relate to each other	HSG-SRT.C.6
Tick marks on the sides of a triangle indicate that those sides are congruent	HSG-SRT.B.5
A right angle in a triangle can be in any position	4.G.A.2
Equiangular triangles have three angles of 60 degrees and have equal side lengths as well	HSG.CO.B.8
How to prove the Pythagorean Theorem by investigating the relationship that exists among the sides of a right triangle (A square is attached to each	8.G.B.6

side of a right triangle)	
How the sides of a right triangle relate to each other	HSG.CO.B.8
How the Distance Formula is related to the Pythagorean Theorem	8.G.B.8
The x-coordinate of the midpoint is the average of the x-coordinates of the endpoints and the y-coordinate of the midpoint is the average of the y-coordinates of the endpoints	HSN-CN.B.6
Resources Mini Unit 4A:	<p>Glencoe Mathematics Pre-Algebra Chapter 9</p> <p>Diagnostic for prerequisite skills p. 43</p> <p>Applications: Reading Mathematics: Learning Geometry Vocabulary p. 446, Circle Graphs and Spreadsheets p. 452, The Pythagorean Theorem and its proof p. 458-549, Graphing Irrational Numbers p. 465, Ratios in Right Triangles p. 476, Graphing Calculator Investigation: Finding Angles of a Right Triangle p. 482</p> <p>Study guide, review, practice tests p. 483-489</p> <p>Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 9)</p>

MINI UNIT 4B	
Title:	Two-Dimensional Figures
Duration:	2 weeks
Overview:	Identifying relationships between parallel and intersecting lines, identifying properties of congruent triangles, identifying and drawing transformations, finding angle measures of polygons, finding the area of polygons and irregular figures, and finding the area and circumference of circles

Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
Parallel lines are two lines that never touch	HSG.CO.A.1
Transversals are lines that cut through parallel lines	8.G.A.5
The location of interior and exterior angles	8.G.A.5
The location of alternate interior and alternate exterior angles	8.G.A.5
The location of corresponding angles	8.G.A.5
The location of vertical angles	8.G.A.5
The location of adjacent angles	8.G.A.5
The location of complementary angles	8.G.A.5
The location of supplementary angles	8.G.A.5
The location of perpendicular angles	8.G.A.5
Methods to find and prove congruent triangles	8.G.A.5
Methods to find corresponding parts of congruent triangles	HSG-CO.B.7
Visual representations of line symmetry	4.G.A.3
Visual representations of bilateral symmetry	4.G.A.3
Visual representations of rotational/turn symmetry	4.G.A.3
Types of transformations	HSG-CO.A.2
Definition of a translation on a coordinate plane	HSG-CO.A.4

Definition of a reflection on a coordinate plane	HSG-CO.A.4
Types of lines of symmetry	4.G.A.3
Definition of a rotation on a coordinate plane	HSG-CO.A.4
Definition of a dilation on a coordinate plane	HSG-CO.A.4
Types of quadrilaterals and their formulas for area and angle sum	7.G.B.6
The location of a base of a triangle	7.G.B.6
The location of the altitude of a triangle	7.G.B.6
Classifications of polygons	7.G.B.6
The location of a diagonal of various polygons and its application when solving for side lengths	HSG-CO.C.11
Formula for the interior angles of regular polygons	8.G.A.5
The definition of a regular polygon	HSG-CO.C.10
Definition of a tessellation and its artistic applications in addition to its application in architecture	6.G.A.3
Parts of a circle: center, radius	7.G.B.4
The definition of a diameter and its role in computing area and circumference	7.G.B.4
The definition and formula for circumference	7.G.B.4
Pi is an irrational number and is the foundation for many geometric properties	7.G.B.4
Types of irregular figures and methods to find the area of an irregular figure	7.G.B.6

Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to identify the relationships of angles formed by two parallel lines and a transversal	8.G.A.5
How to identify the relationships of vertical, adjacent, complementary, and supplementary angles	8.G.A.5
How to find the measures of angles given two parallel lines and a transversal	8.G.A.5
How to construct a line segment, angle, and bisector using a compass	HSG-CO.D.12
How to identify congruent triangles and corresponding parts of congruent triangles	HSG-CO.B.7
How to use congruence statements	8.G.A.5
How to find missing angle measures by applying congruence statements	8.G.A.5
How to determine if a figure has line symmetry or rotational symmetry	4.G.A.3
How to draw translations, rotations, and reflections on a coordinate plane	HSG-CO.A.4
How to perform a dilation on a figure on a coordinate plane	HSG-CO.A.4
How to find the missing angle measures of a quadrilateral	7.G.B.6
How to classify quadrilaterals	7.G.B.6
How to find the areas of various polygons using	7.G.B.6

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How to find the area of parallelograms	HSG-GPE.B.7
How to find the areas of triangles and trapezoids	HSG-GPE.B.7
How to use area to solve real-world problems	HSG-GPE.B.7
How to apply prefixes when defining various polygons	7.G.B.6
How to classify polygons	7.G.B.6
How to determine the sum of the measures of the interior and exterior angles of a polygon	7.G.B.6
How to create a tessellation using various transformations	7.G.B.6
How to find the area and circumference of circles	7.G.B.4
How to evaluate expressions involving Pi using a calculator	7.G.B.4
How to find the area of irregular figures given a real world context	7.G.B.6
Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
How parallel lines and angles are related	HSG.CO.A.1
Where congruence triangles are present in nature and other real-life situations	8.G.A.5
If two triangles are congruent, their corresponding sides are congruent and their corresponding angles are congruent	HSG-CO.B.7 8.G.A.5

How transformations are involved in recreational activities	HSG-CO.A.2
How the area of a parallelogram is related to the area of a rectangle	7.G.B.6
How polygons are used in tessellations	7.G.B.6
How circumference and diameter are related	7.G.B.6
Pi is an irrational number	7.G.B.6
How polygons can help find the area of an irregular figure	7.G.B.6
Resources Mini Unit 3C:	<p>Glencoe Mathematics Pre-Algebra Chapter 10 Diagnostic for prerequisite skills p. 491 Applications: Activity: Constructions p. 498-499, Activity: Symmetry p. 505, Activity: Dilations p. 512, Activity: Area and Geoboards p. 518-519, Reading Mathematics: Learning Mathematics Prefixes p. 526, Activity: Tessellations p. 532 Study guide, review, practice tests p. 544-551 Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 10)</p>

MINI UNIT 4C	
Title:	Three-Dimensional Figures
Duration:	2 weeks
Overview:	Identifying three-dimensional figures, finding volumes of three-dimensional figures, finding surface area of three-dimensional figures, identifying similar solids, using precision and significant digits to describe measurements

Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
Perspective	HSG-CO.A.2
Planes	HSG-CO.A.2
Solids	HSG-GMD.B.4
Polyhedrons	HSG-GMD.B.4
Edges	6.G.A.3 7.G.A.3
Vertices	6.G.A.3 7.G.A.3
Faces	6.G.A.3 7.G.A.3
Prisms	6.G.A.3 7.G.A.3
Bases	6.G.A.3 7.G.A.3
Pyramids	7.G.A.3
Skew lines	6.G.A.3
Volume	HSG-GMD.A.3 7.G.B.6
Cones	HSG-GMD.A.3
Surface area	7.G.B.6
Cylinders	HSG-GMD.D.3

Lateral faces	7.G.B.6
Slant faces	7.G.B.6
Lateral areas	7.G.B.6
Solids	7.G.B.6
Similar solids	7.G.B.6
Precision and accuracy	HSN-Q.A.3
Significant digits	HSN-Q.A.3
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to identify three-dimensional figures	7.G.A.3
How to identify diagonals and skew lines	7.G.A.3
How to find volumes of prisms, complex solids, and rectangular prisms	HSG-GMD.A.3 7.G.B.6
How to find volumes of circular cylinders	HSG-GMD.A.3 7.G.B.6
How to find the height of a prism	6.G.A.3 7.G.A.3
How to find volumes of pyramids and cones	HSG-GMD.A.3 7.G.B.6
How to use volume to solve real-world problems	HSG-GMD.A.3 7.G.B.6
How to find surface area of a triangular prism	7.G.B.6
How to find surface area of a cylinder	7.G.B.6

How to find surface area of pyramids	7.G.B.6
How to find surface area of cones	7.G.B.6
How to identify and compare similar solids	7.G.B.6
How to solve problems involving similar solids	7.G.B.6
How to describe measurements using precision and significant digits	HSN-Q.A.3
How to apply precision and significant digits in problem-solving situations	HSN-Q.A.3
How to add and multiply measurements	HSN-Q.A.3
Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
How to analyze real-world drawings	7.G.A.1
How two-dimensional figures and three-dimensional figures are related	7.G.B.6
How volume is related to area	HSG-GMD.A.1
How the volume of a pyramid is related to the volume of a prism	HSG-GMD.A.1
The height of a pyramid is the distance from the vertex, perpendicular to the base	HSG-GMD.A.1
The surface area of a solid different from its volume	7.G.B.6 HSG-GMD.A.1
Surface area are important in architecture	7.G.B.6
How linear dimensions can be used to identify similar solids	7.G.B.6

Why all measurements are really approximations	7.G.B.6
The least precise measure determines the number of significant digits in the sum or difference of measures	7.G.B.6
Resources Mini Unit 4C:	<p>Glencoe Mathematics Pre-Algebra Chapter 11 Diagnostic for prerequisite skills p. 553 Applications: Activity: Building Three-Dimensional Figures p. 554-555, Activity: Volume with containers p. 562, Activity: Similar Solids p. 583, Reading Mathematics: Precision and Accuracy p. 589, Study guide, review, practice tests p. 595-601 Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 11)</p>

MINI UNIT 4D	
Title:	If time permits: Extending Algebra to Statistics and Polynomials
Duration:	1 week
Overview:	Displaying and interpreting data in stem-and-leaf plots, box-and-whisker plots, and histograms, finding measures of variation, recognizing misleading statistics, count outcomes using tree diagrams, the Fundamental Counting Principle, permutations, and combinations, finding probabilities and odds
Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
Components of stem-and-leaf plots and their purpose	HSS-ID.A.1
Locations of stems and leaves	HSS-ID.A.1
When to use back-to-back stem-and-leaf plots given context	HSS-ID.A.1
Measures of variation and their formulas	HSS-ID.A.2 7.SP.B.4

Formula for range and its definition	HSS-ID.A.2 7.SP.B.4
Definition of quartiles and its location on boxplots	HSS-ID.A.2
Differences between lower quartiles and upper quartiles	HSS-ID.A.2
Definition and formula for interquartile range	HSS-ID.A.2
Components of box-and-whisker plots and their purpose	HSS-ID.A.2
Components of histograms and their purpose	HSS-ID.A.1
Real world examples of misleading statistics	HSS-ID.A.3
Components of bar graphs and their purpose	HSS-ID.A.1
Components of line graphs and their purpose	HSS-ID.A.3
Statistics can be used to gain information about a population by examining a sample of the population by examining a sample of the population	HSS-ID.A.1 7.SP.A.1
Labels and scales of various charts and plots	HSS-ID.A.1
Tree diagrams can be used to solve conditional probabilities and probabilities of compound events	HSS-CP.B.6 7.SP.C.8
Fundamental Counting Principle	HSS-CP.B.6
Permutations and combinations can be used to compute probabilities of compound events and solve problems	HSS-CP.B.9
Factorials are used to compute combinations and permutations	HSS-CP.B.9

Odds refer to the chance of an event represented as a ratio	7.SP.C.5
The probability of compound events is the fraction of outcomes in the sample space for which the compound event occurs	7.SP.C.8
Independent events include outcomes that do not affect each other and its associated probabilities can be computed using the multiplication rule	HSS-CP.A.2 HSS-CP.B.8
Dependent events include outcomes that do not affect each other and its associated probabilities can be computed using the general multiplication rule	HSS-CP.A.2 HSS-CP.B.8
Mutually exclusive events have no outcomes in common	HSS-CP.A.2 HSS-CP.B.8
Simulations can be conducted to help answer statistical questions	7.SP.A.2 HSS-MD.B.6
Essential Outcomes - Upon completion of this course students will know (procedural):	Alignment to Standards
How to display and interpret data in stem-and-leaf plots	HSS-ID.A.1
How to compare two sets of data	HSS-ID.A.1
How to find measures of variation	HSS-ID.A.2 7.SP.B.4
How to use measures of variables to interpret and compare data	HSS-ID.A.2 7.SP.B.4
How to display and interpret data in a box-and-whisker plot	HSS-ID.A.1

How to find outliers	HSS-ID.A.3
How to display and interpret data in a histogram	HSS-ID.A.1
How to recognize when statistics are misleading	HSS-ID.A.3
How to use tree diagrams or the Fundamental Counting Principle to count outcomes	HSS-CP.B.6 7.SP.C.8
How to use the Fundamental Counting Principle to find the probability of an event	HSS-CP.B.6 7.SP.C.8
How to use permutations and combinations	HSS-CP.B.9
How to use factorial notation	HSS-CP.B.9
How to use a combination to solve a problem	HSS-CP.B.9
How to find the odds of a simple event	7.SP.C.5
How to find the probability of independent and dependent events	HSS-CP.A.2 HSS-CP.B.8
How to find the probability of mutually exclusive events	HSS-CP.A.2 HSS-CP.B.8
How to conduct simulations	7.SP.A.2 HSS-MD.B.6
Essential Outcomes - Upon completion of this course students will know (conceptual):	Alignment to Standards
How stem-and-leaf plots help understand elections and other real-life events	HSS-ID.A.1
The difference between stems and leaves	HSS-ID.A.1
Why measures of variation are important	HSS-ID.A.2

	7.SP.B.4
How box-and-whisker plots help interpret data	HSS-ID.A.1
The median may not always divide a boxplot in half because the data may be clustered toward one quartile	HSS-ID.A.1 HSS-ID.A.2 7.SP.B.4
The length of the boxplot affects the spread of the data	HSS-ID.A.2 7.SP.B.4
How graphs can be misleading	HSS-ID.A.3
How the Fundamental Counting Principle can help count multiple types of outcomes from different possible scenarios	HSS-CP.B.6 7.SP.C.8
Why order is sometimes important when determining outcomes	HSS-CP.B.9
Why odds are related to probability	7.SP.C.5
How compound events are related to simple events	7.SP.C.8
How simulations can help predict outcomes of probability events	7.SP.A.2 HSS-MD.B.6
Resources Mini Unit 4D:	<p>Glencoe Mathematics Pre-Algebra Chapter 12 Diagnostic for prerequisite skills: p. 605 Applications: Graphing Calculator Investigation: Box-and-Whisker Plots p. 622, Graphing Calculator Investigation p. 629, Reading Mathematics: Dealing with Bias p. 634, Activity: Probability and Pascal's Triangle p. 640, Activity: Simulations p. 656 Study guide, review, practice tests p. 658-665 Additional resources: Online tests and vocabulary review www.pre-alg.com (chapter 12)</p>

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