Diocese of Greensburg Curriculum
Pre Algebra

Unit	Standards	Content	Skills
Integers	**CCSS: Mathematics** **CCSS: Grade 7** **The Number System** **7.NS.A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.** 7.NS.A.1c. Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. 7.NS.A.2b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real-world contexts. **CCSS: Grade 8** **Expressions & Equations** **8.EE.A. Work with radicals and integer exponents.** 8.EE.A.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. **NCTM: Mathematics** **NCTM: Grades 6 - 8** **Number & Operations**	• Integer • Mathematical Operations with Integers(addition, subtraction, multiplication, division) • Absolute value • Mathematical Properties (Closure, Properties of addition and multiplication) • Laws of Exponents • Powers of Exponents • Exponential notation • Problem solving strategies	The students will be able to: **Knowledge** • Define integers • Define absolute value • Read and identify integers • Locate integers on a number line • Identify opposites • Explaining the meaning of zero **Comprehension** • Compare and order integers • Find the absolute value of a number • Write numbers in exponential form **Application** • Use integers to represent real-world situations • Add, subtract, multiply and divide integers • Use positive and negative numbers to represent quantities in real-world contexts, • Apply the laws of exponents **Analysis** • Understand and apply that positive and negative numbers are used together to describe quantities having opposite directions or

Unit	Standards	Content	Skills
	Understand meanings of operations and how they relate to one another understand the meaning and effects of arithmetic operations with fractions, decimals, and integers; use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with integers, fractions, and decimals; **Compute fluently and make reasonable estimates** develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use; **Process Standards** **Communication** Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others; Use the language of mathematics to express mathematical ideas precisely. **Connections** Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics © Copyright 2010. National Governors Association Center for Best Practices and		values(temperature, sea-level, electrical charges)

Unit	Standards	Content	Skills
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Algebraic Expressions and Equations	**CCSS: Mathematics** **CCSS: Grade 7** **The Number System** **7.NS.A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.** 7.NS.A.1c. Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. **Expressions & Equations** **7.EE.A. Use properties of operations to generate equivalent expressions.** 7.EE.A.1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. 7.EE.A.2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. **7.EE.B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.** 7.EE.B.4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. **CCSS: Grade 8**	• Terms of an expression • Algebraic expressions • Variables • The Order of Operations • Evaluating Expressions • Inductive Reasoning • Patterns • Properties of Equality • One-step equations • Two-step equations • Transform Formulas • Problem solving strategies	The students will be able to: **Knowledge** • Match equations and expressions to their written descriptions. • Identify patterns **Comprehension** • Locate points on a coordinate plane. **Application** • Relate equations to real world issues. • Calculate the absolute value. • Apply the Order of Operations to simplify an expression. • Write variable expressions for verb phrases • Evaluate expressions for a given variable • Combine like terms • Apply the Equality Properties in solving equation • Solve one and two step equations • solve two-step equations with variables on both sides. • Transform formulas in order to solve for a missing variable. • Write an equation for a given word prompt. • Solve equations involving Integers **Analysis**

Unit	Standards	Content	Skills
	Expressions & Equations **8.EE.C. Analyze and solve linear equations and pairs of simultaneous linear equations.** 8.EE.C.7. Solve linear equations in one variable. 8.EE.C.7a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). 8.EE.C.7b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. **NCTM: Mathematics** **NCTM: Grades 6 - 8** **Number & Operations** **Understand numbers, ways of representing numbers, relationships among numbers, and number systems** develop meaning for integers and represent and compare quantities with them. **Understand meanings of operations and how they relate to one another** understand the meaning and effects of arithmetic operations with fractions, decimals, and integers; **Compute fluently and make reasonable estimates** develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use; **Algebra** **Understand patterns, relations, and functions**		• Construct equations based on a written prompt. • Analyze data **Synthesis** • Formulate Expressions and Equations from written words.

Unit	Standards	Content	Skills
	represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules; **Represent and analyze mathematical situations and structures using algebraic symbols** develop an initial conceptual understanding of different uses of variables; **Use mathematical models to represent and understand quantitative relationships** model and solve contextualized problems using various representations, such as graphs, tables, and equations. **Process Standards** **Problem Solving** Build new mathematical knowledge through problem solving Solve problems that arise in mathematics and in other contexts Apply and adapt a variety of appropriate strategies to solve problems Monitor and reflect on the process of mathematical problem solving **Reasoning and Proof** Make and investigate mathematical conjectures **Communication** Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others;		

Unit	Standards	Content	Skills
	Use the language of mathematics to express mathematical ideas precisely. **Connections** Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics **Representation** Create and use representations to organize, record, and communicate mathematical ideas Select, apply, and translate among mathematical representations to solve problems Use representations to model and interpret physical, social, and mathematical phenomena 		
Inequalities	**CCSS: Mathematics** **CCSS: Grade 7** **Expressions & Equations** **7.EE.B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.**	• Properties of Numbers • The Distributive Property • Inequality symbols • Inequalities and Their Graphs • Solving Inequalities by Adding or Subtracting	The students will be able to: **Knowledge** • Identify and correctly use inequality symbols • Explain the distributive property

Unit	Standards	Content	Skills
	7.EE.B.4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. 7.EE.B.4b. Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. **CCSS: Grade 8** **Expressions & Equations** **8.EE.C. Analyze and solve linear equations and pairs of simultaneous linear equations.** 8.EE.C.7b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. **NCTM: Mathematics** **NCTM: Grades 6 - 8** **Number & Operations** **Understand numbers, ways of representing numbers, relationships among numbers, and number systems** develop meaning for integers and represent and compare quantities with them. **Understand meanings of operations and how they relate to one another** understand the meaning and effects of arithmetic operations with fractions, decimals, and integers; use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with integers, fractions, and decimals;	• Solving Inequalities by Multiplying or Dividing • Problem solving strategies	**Comprehension** • Solve an Inequalities by using addition or subtraction • Solve an Inequality by using multiplication or division **Application** • Apply the distributive property • Graph solutions of inequalities on a number line

Unit	Standards	Content	Skills
	understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems. **Compute fluently and make reasonable estimates** develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use; **Algebra** **Represent and analyze mathematical situations and structures using algebraic symbols** develop an initial conceptual understanding of different uses of variables; recognize and generate equivalent forms for simple algebraic expressions and solve linear equations **Use mathematical models to represent and understand quantitative relationships** model and solve contextualized problems using various representations, such as graphs, tables, and equations. **Process Standards** **Problem Solving** Build new mathematical knowledge through problem solving Solve problems that arise in mathematics and in other contexts Apply and adapt a variety of appropriate strategies to solve problems Monitor and reflect on the process of mathematical problem solving **Reasoning and Proof**		

Unit	Standards	Content	Skills
	Make and investigate mathematical conjectures **Communication** Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others; Use the language of mathematics to express mathematical ideas precisely. **Connections** Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics **Representation** Create and use representations to organize, record, and communicate mathematical ideas Select, apply, and translate among mathematical representations to solve problems Use representations to model and interpret physical, social, and mathematical phenomena 		

Unit	Standards	Content	Skills
Decimals	**CCSS: Mathematics** **CCSS: Grade 7** **The Number System** **7.NS.A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.** 7.NS.A.2d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. **Expressions & Equations** **7.EE.B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.** 7.EE.B.3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. **CCSS: Grade 8** **The Number System** **8.NS.A. Know that there are numbers that are not rational, and approximate them by rational numbers.** 8.NS.A.1. Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that	• Rational Numbers • Equivalent Numbers • Rounding and Estimating • Estimating Decimal Products and Quotients • Scientific Notation • Solving Equations by Adding or Subtracting Decimals • Solving Equations by Multiplying or Dividing Decimals • Using Metric System • Negative exponents • Problem solving strategies • Repeating and terminating decimals	The students will be able to: **Knowledge** • Estimate the sum, difference, product, or quotient of given expressions • Match formulas to given situations • Write numbers in scientific notation • Write numbers in standard form **Comprehension** • Add and subtract decimals • Multiply and divide decimals • Convert within the metric system • Compare and order numbers written in scientific notation • Write powers with negative exponents as decimals **Application** • Solve decimal equations using addition and subtraction • Solve decimal equations using multiplication and division • Solve two step equations • Simplify and evaluate expressions with negative exponents **Analysis**

Unit	Standards	Content	Skills
	terminate in 0s or eventually repeat. Know that other numbers are called irrational. **Expressions & Equations** **8.EE.A. Work with radicals and integer exponents.** 8.EE.A.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. 8.EE.A.3. Use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. 8.EE.A.4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. **NCTM: Mathematics** **NCTM: Grades 6 - 8** **Number & Operations** **Understand numbers, ways of representing numbers, relationships among numbers, and number systems** work flexibly with fractions, decimals, and percents to solve problems; compare and order fractions, decimals, and percents efficiently and find their approximate locations on a number line; **Understand meanings of operations and how they relate to one another**		• Develop and apply strategies to solve problems

Unit	Standards	Content	Skills
	understand the meaning and effects of arithmetic operations with fractions, decimals, and integers; use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with integers, fractions, and decimals; understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems. **Compute fluently and make reasonable estimates** select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators or computers, and paper and pencil, depending on the situation, and apply the selected methods; develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use; develop and use strategies to estimate the results of rational-number computations and judge the reasonableness of the results; **Algebra** **Understand patterns, relations, and functions** represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules; **Represent and analyze mathematical situations and structures using algebraic symbols** develop an initial conceptual understanding of different uses of variables;		

Unit	Standards	Content	Skills
	Use mathematical models to represent and understand quantitative relationships model and solve contextualized problems using various representations, such as graphs, tables, and equations. **Measurement** **Understand measurable attributes of objects and the units, systems, and processes of measurement** understand both metric and customary systems of measurement; understand relationships among units and convert from one unit to another within the same system; **Apply appropriate techniques, tools, and formulas to determine measurements** use common benchmarks to select appropriate methods for estimating measurements; **Data Analysis & Probability** **Select and use appropriate statistical methods to analyze data** find, use, and interpret measures of center and spread, including mean and interquartile range; **Process Standards** **Problem Solving** Build new mathematical knowledge through problem solving Solve problems that arise in mathematics and in other contexts Apply and adapt a variety of appropriate strategies to solve problems Monitor and reflect on the process of mathematical problem solving **Reasoning and Proof**		

Unit	Standards	Content	Skills
	Make and investigate mathematical conjectures **Communication** Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others; Use the language of mathematics to express mathematical ideas precisely. **Connections** Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics **Representation** Create and use representations to organize, record, and communicate mathematical ideas Select, apply, and translate among mathematical representations to solve problems Use representations to model and interpret physical, social, and mathematical phenomena 		
Fractions	**CCSS: Mathematics**	• Divisibility and Factors	The students will be able to:

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	CCSS: Grade 7 **The Number System** **7.NS.A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.** 7.NS.A.2b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real-world contexts. **Expressions & Equations** **7.EE.B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.** 7.EE.B.3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. **CCSS: Grade 8** **The Number System** **8.NS.A. Know that there are numbers that are not rational, and approximate them by rational numbers.** 8.NS.A.1. Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers are called irrational.	• Exponents • Least Common Multiple • Greatest Common Factor • Compare and order Rational Numbers • Add and subtract fractions and mixed numbers • Multiply and divide fractions and mixed numbers • Order of operations - rational numbers • Equations with fractions • Prime Factorization • Simplifying Fractions • Account for all Possibilities-Solve a Simpler Problem • Problem solving strategies • Review properties • Customary Units of Measurement	**Knowledge** • List the prime factors of a number • List fractions in descending or ascending order **Comprehension** • Calculate the prime factorization of a number • Compare and order fractions using the number line • Convert between US customary units using dimensional analysis **Application** • Calculate the Greatest Common Factor (GCF) • Calculate the Least Common Multiple (LCM) • Add and subtract fractions and mixed numbers • Solve more difficult problems by creating simpler problems • Simplify fractional expressions • Solve equations with fractions using addition and subtraction • Solve equations with fractions using multiplication and division

Unit	Standards	Content	Skills
	8.NS.A.2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions **Expressions & Equations** **8.EE.C. Analyze and solve linear equations and pairs of simultaneous linear equations.** 8.EE.C.7b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. **NCTM: Mathematics** **NCTM: Grades 6 - 8** **Number & Operations** **Understand numbers, ways of representing numbers, relationships among numbers, and number systems** work flexibly with fractions, decimals, and percents to solve problems; compare and order fractions, decimals, and percents efficiently and find their approximate locations on a number line; develop an understanding of large numbers and recognize and appropriately use exponential, scientific, and calculator notation; use factors, multiples, prime factorization, and relatively prime numbers to solve problems **Understand meanings of operations and how they relate to one another** understand the meaning and effects of arithmetic operations with fractions, decimals, and integers; **Compute fluently and make reasonable estimates**		

Unit	Standards	Content	Skills
	select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators or computers, and paper and pencil, depending on the situation, and apply the selected methods; develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use; **Algebra** **Represent and analyze mathematical situations and structures using algebraic symbols** develop an initial conceptual understanding of different uses of variables; **Geometry** **Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships** create and critique inductive and deductive arguments concerning geometric ideas and relationships, such as congruence, similarity, and the Pythagorean relationship. **Process Standards** **Problem Solving** Build new mathematical knowledge through problem solving Solve problems that arise in mathematics and in other contexts Apply and adapt a variety of appropriate strategies to solve problems Monitor and reflect on the process of mathematical problem solving **Reasoning and Proof**		

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	Make and investigate mathematical conjectures **Communication** Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others; Use the language of mathematics to express mathematical ideas precisely. **Connections** Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics **Representation** Create and use representations to organize, record, and communicate mathematical ideas Select, apply, and translate among mathematical representations to solve problems Use representations to model and interpret physical, social, and mathematical phenomena 		

Unit	Standards	Content	Skills
Ratios, Proportions	**CCSS: Mathematics** **CCSS: Grade 7** **Ratios & Proportional Relationships** **7.RP.A. Analyze proportional relationships and use them to solve real-world and mathematical problems.** 7.RP.A.1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. 7.RP.A.2. Recognize and represent proportional relationships between quantities. 7.RP.A.2a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. 7.RP.A.2b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. 7.RP.A.2c. Represent proportional relationships by equations. 7.RP.A.3. Use proportional relationships to solve multistep ratio and percent problems. **NCTM: Mathematics** **NCTM: Grades 6 - 8** **Number & Operations** **Understand numbers, ways of representing numbers, relationships among numbers, and number systems** work flexibly with fractions, decimals, and percents to solve problems;	• Ratios and Unit Rates • Proportions • Similar Figures and Scale Drawings • Problem Solving strategies	The students will be able to: **Knowledge** • Express a ratio in different forms • Write expressions or equations involving proportions • Name corresponding parts of similar figures **Comprehension** • Solve equations involving proportions • Use division to find unit rates and ratios in proportional relationships **Application** • Create a ratio or proportion for a given scenario • Use proportions to solve scale drawings. • Use proportions to create scale drawings • Solve inverse proportions

Unit	Standards	Content	Skills
	compare and order fractions, decimals, and percents efficiently and find their approximate locations on a number line; develop meaning for percents greater than 100 and less than 1; understand and use ratios and proportions to represent quantitative relationships; develop meaning for integers and represent and compare quantities with them. **Understand meanings of operations and how they relate to one another** understand the meaning and effects of arithmetic operations with fractions, decimals, and integers; **Compute fluently and make reasonable estimates** select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators or computers, and paper and pencil, depending on the situation, and apply the selected methods; develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use; develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios. **Algebra** **Understand patterns, relations, and functions** represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules; relate and compare different forms of representation for a relationship;		

Unit	Standards	Content	Skills
	Represent and analyze mathematical situations and structures using algebraic symbols develop an initial conceptual understanding of different uses of variables; **Geometry** **Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships** precisely describe, classify, and understand relationships among types of two- and three-dimensional objects using their defining properties; understand relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects; **Apply transformations and use symmetry to analyze mathematical situations** examine the congruence, similarity, and line or rotational symmetry of objects using transformations. **Use visualization, spatial reasoning, and geometric modeling to solve problems** draw geometric objects with specified properties, such as side lengths or angle measures; use visual tools such as networks to represent and solve problems; use geometric models to represent and explain numerical and algebraic relationships; recognize and apply geometric ideas and relationships in areas outside the mathematics classroom, such as art, science, and everyday life. **Measurement**		

Unit	Standards	Content	Skills
	Apply appropriate techniques, tools, and formulas to determine measurements solve problems involving scale factors, using ratio and proportion; **Data Analysis & Probability** **Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them** formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population; **Develop and evaluate inferences and predictions that are based on data** use observations about differences between two or more samples to make conjectures about the populations from which the samples were taken; use conjectures to formulate new questions and plan new studies to answer them. **Understand and apply basic concepts of probability** understand and use appropriate terminology to describe complementary and mutually exclusive events; use proportionality and a basic understanding of probability to make and test conjectures about the results of experiments and simulations; compute probabilities for simple compound events, using such methods as organized lists, tree diagrams, and area models. **Process Standards** **Problem Solving**		

Unit	Standards	Content	Skills
	Build new mathematical knowledge through problem solving Solve problems that arise in mathematics and in other contexts Apply and adapt a variety of appropriate strategies to solve problems Monitor and reflect on the process of mathematical problem solving **Reasoning and Proof** Make and investigate mathematical conjectures **Communication** Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others; Use the language of mathematics to express mathematical ideas precisely. **Connections** Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics **Representation**		

Unit	Standards	Content	Skills
	Create and use representations to organize, record, and communicate mathematical ideas Select, apply, and translate among mathematical representations to solve problems Use representations to model and interpret physical, social, and mathematical phenomena 		
Percents	**CCSS: Mathematics** **CCSS: Grade 7** **Ratios & Proportional Relationships** **7.RP.A. Analyze proportional relationships and use them to solve real-world and mathematical problems.** 7.RP.A.3. Use proportional relationships to solve multistep ratio and percent problems. **NCTM: Mathematics** **NCTM: Grades 6 - 8** **Process Standards** **Communication** Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others; Use the language of mathematics to express mathematical ideas precisely.	• Percents • Relationship between fractions decimals and percents • Percent of a number • Estimation using percents • Percent of increase and decrease • Sales tax • Discount and mark up • Simple interest • Compound interest • Problem solving strategies	The students will be able to: **Knowledge** • Model percents • Write percents as ratios • Write ratios as percents • Write percents as fractions and decimals • Write fractions and decimals as percents **Comprehension** • Calculate the percent of a number • Solve percent problems using estimation • Compute simple interest • Compute compound interest **Application** • Calculate percent of increase and percent of decreases • Calculate sales tax • Calculate discount and mark up

Unit	Standards	Content	Skills
	Connections Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics 		
Data Analysis	**CCSS: Mathematics** **CCSS: Grade 7** **Statistics & Probability** **7.SP.A. Use random sampling to draw inferences about a population.** 7.SP.A.2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. **CCSS: Grade 8** **Statistics & Probability** **8.SP.A. Investigate patterns of association in bivariate data.** 8.SP.A.1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	• Frequency Tables and Line Plots • Box and Whisker Plots • Bar Graphs • Stem and Leaf Plots • Venn Diagrams • Scatter Plots • Using Graphs to Persuade • Mean, Median, Mode • Random Samples and Surveys • Simulate the Problem (Problem Solving)	The students will be able to: **Knowledge** • Read bar graphs • Read frequency tables • Read histograms • Read stem and leaf plots • Read Venn diagrams • Read box and whisker plots • Read scatter plots **Comprehension** • Interpret bar graphs • Interpret frequency tables • Interpret histograms • Interpret stem and leaf plots • Interpret Venn diagrams • Interpret scatter plots • Calculate mean, median and mode of a given set of data **Application**

Unit	Standards	Content	Skills
	NCTM: Mathematics **NCTM: Grades 6 - 8** **Data Analysis & Probability** **Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them** formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population; select, create, and use appropriate graphical representations of data, including histograms, box plots, and scatterplots. **Select and use appropriate statistical methods to analyze data** find, use, and interpret measures of center and spread, including mean and interquartile range; discuss and understand the correspondence between data sets and their graphical representations, especially histograms, stem-and-leaf plots, box plots, and scatterplots. **Develop and evaluate inferences and predictions that are based on data** use observations about differences between two or more samples to make conjectures about the populations from which the samples were taken; make conjectures about possible relationships between two characteristics of a sample on the basis of scatterplots of the data and approximate lines of fit; use conjectures to formulate new questions and plan new studies to answer them. **Process Standards** **Communication**		• Create bar graphs • Create frequency tables • Create histograms • Create stem and leaf plots • Create Venn diagrams • Create scatter plots **Analysis** • Create a survey and organize data • Given random samples organize data

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	Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others; Use the language of mathematics to express mathematical ideas precisely. **Connections** Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics © Copyright 2010. National Governors Association Center for Best Practices and Council of Chief State School Officers. All rights reserved.		
Geometry- Spatial Thinking	**CCSS: Mathematics** **CCSS: Grade 8** **Geometry** **8.G.A. Understand congruence and similarity using physical models, transparencies, or geometry software.** 8.G.A.1a. Lines are taken to lines, and line segments to line segments of the same length.	• Points, Lines, and Planes • Angle Relationships • Measurement of angles • Complementary, Supplementary, Adjacent, Vertical angles • Parallel Lines • Classifying Polygons	The students will be able to: **Knowledge** • Define geometric vocabulary • Identify geometric figures • Classify polygons • Classify angles by measure • Identify types of quadrilaterals

Unit	Standards	Content	Skills
	8.G.A.1b. Angles are taken to angles of the same measure. 8.G.A.1c. Parallel lines are taken to parallel lines. 8.G.A.2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. 8.G.A.4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. 8.G.A.5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. **NCTM: Mathematics** **NCTM: Grades 6 - 8** **Geometry** **Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships** precisely describe, classify, and understand relationships among types of two- and three-dimensional objects using their defining properties; understand relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects;	• Problem Solving strategies • Congruence (Angles, Line segments) • Circles • Constructions(Lines, triangles, angles) • Quadrilateral properties	• Identify parts of a circle **Comprehension** • Use a protractor to measure angles • Identify complementary, supplementary and vertical angles • Identify angles formed by parallel lines and a transversal **Application** • Illustrate a problem in order to solve it • Construct angles and bisectors • Construct congruent triangles • Construct perpendicular lines

Unit	Standards	Content	Skills
	Specify locations and describe spatial relationships using coordinate geometry and other representational systems use coordinate geometry to represent and examine the properties of geometric shapes; use coordinate geometry to examine special geometric shapes, such as regular polygons or those with pairs of parallel or perpendicular sides. **Use visualization, spatial reasoning, and geometric modeling to solve problems** draw geometric objects with specified properties, such as side lengths or angle measures; use two-dimensional representations of three-dimensional objects to visualize and solve problems such as those involving surface area and volume; use visual tools such as networks to represent and solve problems; recognize and apply geometric ideas and relationships in areas outside the mathematics classroom, such as art, science, and everyday life. **Process Standards** **Communication** Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others; Use the language of mathematics to express mathematical ideas precisely. **Connections**		

Unit	Standards	Content	Skills
	Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics 		
Geometry – 2 and 3 dimensions, Perimeter, Area ,Volume	**CCSS: Mathematics** **CCSS: Grade 8** **Geometry** **8.G.A. Understand congruence and similarity using physical models, transparencies, or geometry software.** 8.G.A.2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. 8.G.A.4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. **8.G.B. Understand and apply the Pythagorean Theorem.** 8.G.B.6. Explain a proof of the Pythagorean Theorem and its converse.	• Perimeter of polygons • Pythagorean Theorem • Area of polygons • Circumference and Area of Circles • Square roots • Surface Area of 3-D figures • Volume of 3-D figures • Make a Model (Problem Solving) • Problem solving strategies	The students will be able to: **Knowledge** • Identify shapes • Match area formulas to their given shape • Explain the difference between area and surface area • Explain the difference between area and volume **Comprehension** • Use formulas to find perimeter and area of rectangles, parallelograms, triangles, and trapezoids • Calculate the circumference and area of a circle • Find the square root of perfect squares • Simplify expressions involving square roots • Investigate volume by comparing various shapes

Unit	Standards	Content	Skills
	8.G.B.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. 8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. **8.G.C. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.** 8.G.C.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. **NCTM: Mathematics** **NCTM: Grades 6 - 8** **Geometry** **Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships** precisely describe, classify, and understand relationships among types of two- and three-dimensional objects using their defining properties; understand relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects; **Specify locations and describe spatial relationships using coordinate geometry and other representational systems** use coordinate geometry to represent and examine the properties of geometric shapes; use coordinate geometry to examine special geometric shapes, such as regular polygons or those with pairs of parallel or perpendicular sides.		• Calculate the volume of prisms, pyramids, cylinders, cones and spheres **Application** • Apply the Pythagorean Theorem to find missing sides of a right triangle • Apply formulas to calculate the surface area of three dimensional figures **Analysis** • Develop and apply strategies to solve problems

Unit	Standards	Content	Skills
	Apply transformations and use symmetry to analyze mathematical situations describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling; **Use visualization, spatial reasoning, and geometric modeling to solve problems** draw geometric objects with specified properties, such as side lengths or angle measures; use two-dimensional representations of three-dimensional objects to visualize and solve problems such as those involving surface area and volume; use visual tools such as networks to represent and solve problems; use geometric models to represent and explain numerical and algebraic relationships; recognize and apply geometric ideas and relationships in areas outside the mathematics classroom, such as art, science, and everyday life. **Measurement** **Understand measurable attributes of objects and the units, systems, and processes of measurement** understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume. **Apply appropriate techniques, tools, and formulas to determine measurements** select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision; develop and use formulas to determine the circumference of circles and the area of triangles, parallelograms, trapezoids, and circles and		

Unit	Standards	Content	Skills
	develop strategies to find the area of more-complex shapes; develop strategies to determine the surface area and volume of selected prisms, pyramids, and cylinders; **Process Standards** **Communication** Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others; Use the language of mathematics to express mathematical ideas precisely. **Connections** Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics 		

Unit	Standards	Content	Skills
Probability	**CCSS: Mathematics** **CCSS: Grade 7** **Statistics & Probability** **7.SP.C. Investigate chance processes and develop, use, and evaluate probability models.** 7.SP.C.5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. 7.SP.C.6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. 7.SP.C.7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. 7.SP.C.7a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. 7.SP.C.7b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. 7.SP.C.8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. 7.SP.C.8a. Understand that, just as with simple events, the probability of a compound event is	• Counting Outcomes and Theoretical Probability • Independent and Dependent Events • Permutations and Combinations • Experimental Probability • Random Samples and Surveys • Odds • Problem solving strategies	The students will be able to: **Knowledge** • Differentiate between dependent and independent events. • Identify the independent and dependent variables of a word problem. • Define theoretical probability **Comprehension** • Find the experimental probability of an event • Determine the sample space of an experiment • Calculate the odds of a specific outcome **Application** • Investigate and solve problems using permutations or combinations. • Predict the outcome of a theoretical and experimental probability **Analysis** • Develop and apply strategies to solve problems

Unit	Standards	Content	Skills
	the fraction of outcomes in the sample space for which the compound event occurs. 7.SP.C.8b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event. 7.SP.C.8c. Design and use a simulation to generate frequencies for compound events. **NCTM: Mathematics** **NCTM: Grades 6 - 8** **Data Analysis & Probability** **Understand and apply basic concepts of probability** understand and use appropriate terminology to describe complementary and mutually exclusive events; use proportionality and a basic understanding of probability to make and test conjectures about the results of experiments and simulations; compute probabilities for simple compound events, using such methods as organized lists, tree diagrams, and area models. **Process Standards** **Communication** Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others;		

Unit	Standards	Content	Skills
	Use the language of mathematics to express mathematical ideas precisely. **Connections** Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics 		
Linear Functions and Graphing	**CCSS: Mathematics** **CCSS: Grade 8** **Functions** **8.F.A. Define, evaluate, and compare functions.** 8.F.A.2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. 8.F.A.3. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. **8.F.B. Use functions to model relationships between quantities.**	• Relations and Functions • Equations with Two variables • Slope and Y-Intercept • Writing Rules for Linear Functions • Solve by Graphing (Problem Solving) • Solving Systems of Linear Equations • Graphing Linear Inequalities	The students will be able to: **Knowledge** • Define a relation • Define a linear function **Comprehension** • Identify the slope and y-intercept of a graph • Write a rule for a linear equation • Solve equations with two variables • Graph linear inequalities **Application** • Graph linear equations. • Solve systems of linear equations by graphing.

Unit	Standards	Content	Skills
	8.F.B.4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. 8.F.B.5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. **NCTM: Mathematics** **NCTM: Grades 6 - 8** **Algebra** **Understand patterns, relations, and functions** identify functions as linear or nonlinear and contrast their properties from tables, graphs, or equations. **Represent and analyze mathematical situations and structures using algebraic symbols** explore relationships between symbolic expressions and graphs of lines, paying particular attention to the meaning of intercept and slope; use symbolic algebra to represent situations and to solve problems, especially those that involve linear relationships; **Analyze change in various contexts** use graphs to analyze the nature of changes in quantities in linear relationships. **Process Standards** **Communication**		

Unit	Standards	Content	Skills
	Organize and consolidate their mathematical thinking through communication Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others; Use the language of mathematics to express mathematical ideas precisely. **Connections** Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics © Copyright 2010. National Governors Association Center for Best Practices and Council of Chief State School Officers. All rights reserved.		
Nonlinear Functions and Polynomials	**NCTM: Mathematics** **NCTM: Grades 6 - 8** **Algebra** **Understand patterns, relations, and functions** identify functions as linear or nonlinear and contrast their properties from tables, graphs, or equations. **Process Standards** **Communication** Organize and consolidate their mathematical thinking through communication	• Patterns and Sequences • Graphing Nonlinear Functions • Exponential Growth and Decay • Polynomials • Adding and Subtracting Polynomials • Multiplying Binomials • Use Multiple Strategies (Problem Solving)	The students will be able to: **Knowledge** • Describe number patterns with arithmetic sequences • Describe number patterns with geometric sequences • Identify the graph of a polynomial • Use tables, rules and graphs with functions modeling growth or decay

Unit	Standards	Content	Skills
	Communicate their mathematical thinking coherently and clearly to peers, teachers, and others Analyze and evaluate the mathematical thinking and strategies of others; Use the language of mathematics to express mathematical ideas precisely. **Connections** Recognize and use connections among mathematical ideas Understand how mathematical ideas interconnect and build on one another to produce a coherent whole Recognize and apply mathematics in contexts outside of mathematics Used with permission of the National Council of Teachers of Mathematics. This use does not imply endorsement of materials or validation of alignment.		• Use an area model for multiplication **Comprehension** • Use sequences to make predictions • Graph nonlinear functions such as quadratic functions and absolute value functions • Evaluate polynomials • Add or subtract polynomials • Write a polynomial as the product of a monomial and polynomial • Multiply two binomials **Application** • Solve problems involving growth or decay • Solve problems involving area and volume **Analysis** • Use nonlinear functions in modeling real-world situations • Model real-world situations involving population growth • Identify the graph of a polynomial. • Graph nonlinear functions.