SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: Pre-Algebra - 8	**Length of Course:** 30 cycles
Grade Level(s): 8	**Periods Per Cycle:** 6
Units of Credit: 2	**Length of Period:** 47 minutes
Classification: Required	**Total Instructional Time:** 141 hours

Course Description

The Pre-Algebra-8 class provides the foundation for learning algebra before introducing the concepts of Algebra I. The topics covered include properties, integers, rational numbers, equations, inequalities, graphing, proportions, percents, probability, statistics, and geometry.

Instructional Strategies, Learning Practices, Activities, and Experiences

Anchor Charts	Graphic Organizers	Remediation
Anticipatory Sets	Guided Practice	Review (Games, Study Guides)
Assessments (Quizzes, Unit, Teacher-Created)	Higher-Level Questioning	Rocket Period
Bell Ringers	Homework	Simulations
Calculators	Interaction Sequence	Standardized Test Preparation
Class Discussions	Journals	Teacher Demonstrations
Closure (Exit Passes)	Manipulatives	Teacher Observations
Computer Websites and/or Software	Notes (Templates, Teacher or Student Generated)	Technology Integration (iPods, iPads, Clickers,
Cooperative Learning	Partners (Think-Pair-Share)	Computer Labs)
Critical Thinking	Posted and Numbered Objectives	Videos/DVDs
Cross Curricular Connections	Practice Exercises and Tests	Vocabulary (Cards, Strategies, and Lists)
Drill and Practice	Presentations	Wait Time and Wait Time Extended
Flexible Groups	Projects	

Assessments

Assessments (Quizzes, Unit, Teacher-Created)	Evaluation (Summative and Formative)	Presentations
Bell Ringers	Higher-Level Questioning	State Standardized Assessments
Closure	Homework Review	Projects
Classroom Diagnostic Tools (CDT)	Interaction Sequence	Teacher Observations

Materials/Resources

Anchor Charts	Internet Resources	Resource Books
Calculators	Journals	Technology Integration
Graphic Organizers	Literature	Videos/DVDs
McDougal Littel 2008	Manipulatives	Vocabulary (Cards, Strategies, and Lists)

Adopted:
Revised: 8/17/09; 5/19/14; 5/20/2019

2.1 Numbers and Operations	
The Standards of Mathematical Practices	
Make sense of problems and persevere in solving them. **Construct viable arguments and critique the reasoning of others.** **Use appropriate tools strategically.** **Look for and make use of structure.**	**Reason abstractly and quantitatively.** **Model with mathematics.** **Attend to precision.** **Look for and express regularity in repeated reasoning.**
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
The Number System • Determine whether a number is rational or irrational • Show that all rational numbers in fraction form either terminate or repeat • Convert a terminating or repeating decimal into ratio form of a/b (limit repeating decimals to thousandths) • Estimate the values of irrational numbers without a calculator (radicand ≤ 144) • Use rational approximations of irrational numbers at their appropriate locations on the number line • Evaluate square roots of perfect squares (up to and including 12) • Evaluate cube roots and perfect cubes (up to and including 5)	**M08.A-N.1.1.1** – Determine whether a number is rational or irrational. For rational numbers, show that the decimal expansion terminates or repeats (limit repeating decimals to thousandths). **M08.A-N.1.1.2** – Convert a terminating or repeating decimal to a rational number (limit repeating decimals to thousandths). **M08.A-N.1.1.3** – Estimate the value of irrational numbers without a calculator (limit whole number radicand to less than 144). **M08.A-N1.1.4** – Use rational approximations of irrational numbers to compare and order irrational numbers. **M08.A-N.1.1.5** – Locate/identify rational and irrational numbers at their approximate locations on a number line. **M08.B-E.1.1.3** – Estimate very large or very small quantities by using numbers expressed in the form of a single digit times an integer power of 10 and express how many times larger or smaller one number is than another.

2.1 Numbers and Operations (continued)	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Laws of Exponents • Apply one or more properties of integer exponents to generate equivalent numerical expressions • Estimate very large and very small quantities through scientific notation (be able to express how many times larger or smaller one number is than another) • Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used • Express answers in scientific notation and choose units of appropriate size for measurements for very large or very small quantities • Interpret scientific notation that has been generated by technology	**M08.B-E.1.1.1** – Apply one or more properties of integer exponents to generate equivalent numerical expressions without a calculator (with final answers expressed in exponential form with positive exponents.) **Properties will be provided.** **M08.B-E.1.1.3** – Estimate very large and very small quantities by using numbers expressed in the form of a single digit times an integer power of 10 and express how many times larger or smaller one number is than another. **M08.B-E.1.1.4** – Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Express answers in scientific notation and choose units of appropriate size for measurements of very large of very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology (e.g., interpret 4.7EE9 displayed on a calculator as 4.7×10^9).

2.2 Algebraic Concepts	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Expressions and Equations **Solving Equations** • Write and identify linear equations in one variable with one solution • Write and identify linear equations with infinitely many solutions • Write and identify linear equations with no solutions • Solve linear equations that have rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms	**M08.B-E.3.1.1** – Write and identify 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 equations of the form *x* = *a, a* = *a, or a* = *b* results (where *a* and *b* are different numbers).
Functions and Graphs • Determine whether a relation is a function • Graph proportional relationships, interpreting the unit as the slope of the graph • Compare two different proportional relationships represented in different ways • Use similar right triangles to show and explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane • Derive the equation y=mx for a line through the origin • Derive the equation y=mx+b for a line intercepting the vertical axis at b	**M08.B-E.2.1.1** - Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. **M08.B-E.2.1.2** – Use similar right triangles to show and explain why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane. **M08.B-E.2.1.3** – Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at *b*. **M08.B-F.1.1.1** – Determine whether a relation is a function. **M08.B-F.1.1.2** – Compare properties of two functions, each represented in a different way (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions).

2.2 Algebraic Concepts (continued)	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
• Compare properties of two functions each represented in a different way (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions) • 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 • 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 • Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing and decreasing, linear or nonlinear) • Sketch or determine a graph that exhibits the qualitative features of a function that has been described verbally	**M08.B-F.1.1.3** – 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. **M08.B-F.2.1.1** – 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. **M08.B-F.2.1.2** – 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 or determine a graph that exhibits the qualitative features of a function that has been described verbal.
Systems of Equations • Interpret solutions to a system of two linear equations in two variables as points of intersection of their graphs, because points of intersection satisfy both equations simultaneously • Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations • Solve simple cases by inspection • Solve real-world and mathematical problems leading to two linear equations in two variables	**M08.B-E.3.1.3** – Interpret solutions to a system of two linear equations in two variables as points of intersection of their graphs because points of intersection satisfy both equations simultaneously. **M08.B-E.3.1.4** – Solve systems of two linear equations in two variables algebraically and estimate solutions by graphing the equations. Solve simple cases by inspection. **M08.B-E.3.1.5** – Solve real-world and mathematical problems leading to two linear equations in two variables.

2.3 Geometry

CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
Pythagorean Theorem • Apply the converse of the Pythagorean theorem to show a triangle is a right triangle • Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two- and three-dimensions • Apply the Pythagorean theorem to find the distance between two points in a coordinate system • Use square root and cube root symbols to represent solutions to equations of the form $x^2=p$ and $x^3=p$	**M08.B-E.1.1.2 –** Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of perfect squares (up to and including 12^2) and cube roots of perfect cubes (up to and including 5^3) without a calculator. **M08.C-G.2.1.1** – Apply the converse of the Pythagorean theorem to show a triangle is a right triangle. **M08.C-G.2.1.2** – Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two- and three-dimensions. (Figure provided for problems in three dimensions will be consistent with Eligible Content in grade 8 and below.) **M08.C-G.2.1.3 –** Apply the Pythagorean theorem to find the distance between two points in a coordinate system.
Volume • Apply formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems	**M08.C-G.3.1.1** – Apply formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems. **Formulas will be provided.**
Transformations • Identify and apply properties of rotations, reflections, and translations • Given two congruent figures, describe a sequence of transformations that exhibits the congruence between them • Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures, using coordinates • Given two similar two-dimensional figures, describe a sequence of transformations that exhibits the similarity between them	**M08.C-G.1.1.1** – Identify and apply properties of rotations, reflections, and translations. **M08.C-G.1.1.2** – Given two congruent figures, describe a sequence of transformations that exhibits the congruence between them. **M08.C-G.1.1.3** – Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. **M08.C-G.1.1.4** – Given two similar two-dimensional figures, describe a sequence of transformations that exhibits the similarity between them.

2.4 Measurement, Data and Probability	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Statistics and Probability **Bivariate Data** • 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 correlation, linear association, and nonlinear association • For scatter plots that suggest a linear association, identify a line of best fit by judging the closeness of the data points to the line • Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept • Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects • Use relative frequencies calculated for rows or columns to describe possible associations between the two variables.	**M08.D-S.1.1.1** – 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 correlation, linear association, and nonlinear association. **M08.D-S.1.1.2** – For scatter plots that suggest a linear association, identify a line of best fit by judging the closeness of the data points to the line. **M08.D-S.1.1.3** – Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. **M08.D-S.1.2.1** – Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible associations between the two variables.