Course Title: 8th Grade Math
Board Approval Date: 07/2018
Credit / Hours: NA
Reviewed Annually

Course Description:

This course focuses on mastery of the PA Core Standards for 8th Grade Math and incorporates the Assessment Anchors and Eligible Content. As students progress through this course, they will learn real numbers, solving one variable equations, graphing two variable equations, geometric transformations, Pythagorean Theorem, linear functions, data analysis, and factoring. Integrated into every lesson are rigorous applications of the PA Core Standards to prepare students to earn a Proficient or Advanced score on the 8th Grade PSSA.

Learning Activities / Modes of Assessment:

- Large Group Instruction
- Collaborative Learning
- Checklists / Videos of Instruction for Asynchronous Work
- Diagnostic Assessments (CDT)
- AimsWeb Tests
- Quizzes Within Each Unit
- Unit Tests

Instructional Resources:

- iPad, Teacher Macbook
- Teacher Made Resources Aligned to PA Core Standards for 8th Grade Math
- Various internet resources and iPad apps including but not limited to: Desmos, Doceri, Padlet, Khan Academy, IXL Math, Study Island

Course Pacing Guide

Course: 8th Grade Math

Course Unit (Topic)	Length of Instruction (Days/Periods)
1. Real Numbers	20 days
2. One Variable Equations	23 days
3. Two Variable Equations	40 days
4. Geometric Transformations	15 days
5. Pythagorean Theorem	11 days
6. Functions	18 days
7. Data Analysis	13 days
8. Factoring	23 days
DAYS TOTAL	163 Days

CCSD Curriculum
Course: 8th Grade Math

July 2022

Topic: Unit 1 – Real Numbers

Days: 20

KNOW:	UNDERSTAND:	DO:
Rational Number Terminating Decimal Repeating Decimal Irrational Number Algebraic Expression Algebraic Equation Exponent Coefficient Scientific Notation Square Root Perfect Square Cube Root Perfect Cube Absolute Value	How to apply concepts of rational and irrational numbers as well as represent and use expressions and equations to solve problems involving radicals and integer exponents.	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). Example: $\sqrt{5}$ is between 2 and 3 but closer to 2. M08.A-N.1.1.4 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.1.1.1 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.1.1.2 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 122) and cube roots of perfect cubes (up to and including 53) without a calculator. Example: If $x^2 = 25$ then $x = \pm\sqrt{25}$. 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. Example: Estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9 and determine that the world population is more than 20 times larger than the United States' population. 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 or 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).

Name: Unit 1 – Real Numbers
Grade: 8th

Course/Subject: Math
School District: Central Columbia

Key Learning: Students will be able to apply concepts of rational and irrational numbers as well as represent and use expressions and equations to solve problems involving radicals and integer exponents.

Unit Essential Question: How do you apply concepts of rational and irrational numbers as well as represent and use expressions and equations to solve problems involving radicals and integer exponents?

Concept: Rational Numbers	**Concept:** Radical Expressions	**Concept:** Exponents
Lesson Essential Questions: How do you determine if a number is rational? How do you express rational numbers as fractions and decimals? How do you simplify algebraic expressions? How do you evaluate algebraic expressions?	**Lesson Essential Questions:** How can you simplify expressions with square and cube roots? How can you solve equations with square and cube roots? How do you estimate irrational square roots? How do you estimate irrational negative square roots?	**Lesson Essential Questions**: How do you simplify expressions with negative exponents? How do you use the rules of exponents to simplify expressions? How do you simplify exponential expressions with coefficients? How do you write and compare numbers in scientific notation? How do you perform operations in scientific notation? How do you perform operations in scientific notation without a calculator?

Vocabulary:
Rational Number, Terminating Decimal, Repeating Decimal, Irrational Number, Algebraic Expression, Algebraic Equation, Exponent, Coefficient, Scientific Notation, Square Root, Perfect Square, Cube Root, Perfect Cube, Absolute Value

CCSD Curriculum
Course: 8th Grade Math

July 2022

Topic: Unit 2 – One Variable Equations

Days: 23

KNOW:	UNDERSTAND:	DO:
Cylinder Cone Sphere Commutative Property Associative Property Distributive Property Additive Identity Multiplicative Identity Additive Inverse Multiplicative Inverse Multiplicative Property of Zero Property of Equality No Solution Infinitely Many Solutions	How to write, solve, graph, and interpret linear equations in one variable as well as apply volume formulas of cones, cylinders, and spheres.	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 equation of the form x = a, a = a, or a = b results (where a and b are different numbers). M08.B-E.3.1.2 Solve linear equations that have rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. 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.

Name: Unit 2 – One Variable Equations
Grade: 8th Grade

Course/Subject: Math
School District: Central Columbia

Key Learning: Students will be able to write, solve, graph, and interpret linear equations in one variable as well as apply volume formulas of cylinders, cones, and spheres.

Unit Essential Question: How do you write, solve, graph, and interpret linear equations in one variable as well as apply volume formulas of cylinders, cones, and spheres?

Concept: Algebraic Properties	**Concept:** Solving Equations	**Concept:** Types of Solutions
Lesson Essential Questions: How do you simplify algebraic expressions using algebraic properties? How do you use the Property of Equality to solve two-step equations? How do you solve equation with rational coefficients? How do find the volume of a cylinder? How do find the volume of a cone? How do find the volume of a sphere? How do you find the volume of composite figures? How do find the radius or height of a 3-D shape?	**Lesson Essential Questions:** How do you solve an equation with variables on both sides? How do you write and solve linear word problems? How do you solve multi-step equations by combining like terms? How do you solve multi-step equations by the Distributive Property? How do you solve multi-step equations with fractions?	**Lesson Essential Questions**: How do determine if an equation has one, none, or infinitely many solutions?

Vocabulary:
Cylinder, Cone, Sphere, Commutative Property, Associative Property, Distributive Property, Additive Identity, Multiplicative Identity, Additive Inverse, Multiplicative Inverse, Multiplicative Property of Zero, No Solution, Infinitely Many

CCSD Curriculum
Course: 8th Grade Math

July 2022

Topic: Unit 3 – Two Variable Equations

Days: 40

KNOW:	UNDERSTAND:	DO:
Constant Rate of Change Ratio Slope Rise over Run Undefined Y-intercept Linear Relationship Proportional Horizontal Lines Vertical Lines Transformations Linear Systems Solution to a System Intersecting Lines Parallel Lines Coinciding Lines Substitution Elimination	How to analyze and describe linear relationships between two variables, using slope as well as write, solve, graph, and interpret linear equations in two variables, using various methods.	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. Example: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. 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-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. Example: 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6. M08.B-E.3.1.5 Solve real-world and mathematical problems leading to two linear equations in two variables. Example: Given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

Name: Unit 3 – Two Variable Equations
Grade: 8th Grade

Course/Subject: Math
School District: Central Columbia

Key Learning: Students will be able to analyze and describe linear relationships between two variables, using slope as well as write, solve, graph, and interpret linear equations in two variables, using various methods.

Unit Essential Question: How do you analyze and describe linear relationships between two variables, using slope as well as write, solve, graph, and interpret linear equations in two variables, using various methods?

Concept: Slope of a Line	**Concept:** Writing and Graphing Equations of Lines	**Concept:** Solving and Graphing Systems of Equations
Lesson Essential Questions: How do you move between points on a coordinate plane? How do you find the vertical and horizontal change between two points? How do you find the constant rate of change from a table? How do you find equivalent ratios from a table? How do you find the slope of a line given its graph? How do you find the slope of a line when the graph has different scales? How do you find the slope of a line given two points? How does Rise over Run compare to the Slope Formula?	**Lesson Essential Questions:** How do you write equations for proportional relationships? How do you determine if a relationship is proportional or not? What are the two most important characteristics of lines? How do you write linear equations in Slope-Intercept Form? How do you evaluate linear equations in Slope-Intercept Form? How do you write linear equations given various characteristics? How do you write linear equations given a word problem? How do you graph linear equations in the first quadrant? How do you graph lines on a coordinate plane? How do you graph horizontal and vertical lines on a coordinate plane? How do you determine if a table, graph, or equation is linear? How do you interpret linear equations, tables, and graphs? How do you compare the y-intercepts from multiple linear representations? How do you compare the slopes from multiple linear representations?	**Lesson Essential Questions**: How do you determine the solution to a linear system? How do you find a solution to a linear system by graphing? How do you find a solution to a linear system for special cases? How do you determine the number of solutions to a linear system based on their equations? How do you interpret linear systems? How do you find a solution to a linear system by substitution? How do you solve word problems by elimination?

Vocabulary:
Constant Rate of Change, Ratio, Slope, Rise over Run, Undefined, Y-intercept, Linear Relationship, Proportional, Horizontal Lines, Vertical Lines, Transformations, Linear Systems, Solution to a System, Intersecting Lines, Parallel Lines, Coinciding Lines, Substitution, Elimination

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Topic: Unit 4 – Geometric Transformations **Days:** 15

KNOW:	UNDERSTAND:	DO:
Transformation Translation Reflections Rotations Dilations Enlargement Reduction Scale Factor Congruence Similarity Slope Triangles Proportional Figures	How to apply properties of geometric transformations to verify congruence or similarity.	M08.C-G.1.1.1 Identify and apply properties of rotations, reflections, and translations. Example: Angle measures are preserved in 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.

Name: Unit 4 – Geometric Transformations
Grade: 8th Grade

Course/Subject: Math
School District: Central Columbia

Key Learning: Students will be able to apply properties of geometric transformations to verify congruence or similarity.

Unit Essential Question: How do you apply properties of geometric transformations to verify congruence and similarity?

Concept: Geometric Transformations	**Concept:** Congruence and Similarity
Lesson Essential Question: How do you identify congruent parts to congruent figures? How do you perform and interpret geometric translations? How do you perform and interpret geometric reflections? How do you perform and interpret geometric rotations? How do you identify parts to similar figures? How do you perform dilations on a coordinate grid?	**Lesson Essential Question:** How do you determine congruent and similar parts to slope triangles formed from a line? How do you identify and perform multiple transformations?

Vocabulary:
Transformation, Translation, Reflections, Rotations, Dilations, Enlargement, Reduction, Scale Factor, Congruence, Similarity, Slope Triangles, Proportional Figures

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July 2022

Topic: Unit 5 – Pythagorean Theorem

Days: 11

KNOW:	UNDERSTAND:	DO:
Pythagorean Theorem Hypotenuse Leg Converse of the Pythagorean Theorem	How to solve problems involving right triangles by applying the Pythagorean theorem.	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. (Figures 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.

Name: Unit 5 – Pythagorean Theorem
Grade: 8th Grade

Course/Subject: Math
School District: Central Columbia

Key Learning: Students will be able to solve problems involving right triangles by applying the Pythagorean Theorem.

Unit Essential Question: How do you solve problems involving right triangles by applying the Pythagorean Theorem?

Concept:
Using the Pythagorean Theorem

Lesson Essential Question:

How do you find the distance between two points on a coordinate grid?

How do you use the Pythagorean Theorem to find the missing side of a right triangle? How do you use the Pythagorean Theorem to solve word problems?

How do you use the Converse of the Pythagorean Theorem to prove right triangles?

How do you use Pythagorean Triples to determine the missing side of a right triangle?

Vocabulary:
Pythagorean Theorem, Hypotenuse, Leg, Converse of the Theorem, Pythagorean Triple

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July 2022

Topic: Unit 6 – Functions

Days: 18

KNOW:	UNDERSTAND:	DO:
Relations Functions Domain Range Function Notation Linear Function Qualitative Graphs	Define, evaluate, and compare functions displayed algebraically, graphically, or numerically in tables or by verbal descriptions as well as represent or interpret functional relationships between quantities using tables, graphs, and descriptions.	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). 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. 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 verbally.

Name: Unit 6 – Functions
Grade: 8th Grade

Course/Subject: Math
School District: Central Columbia

Key Learning: Students will be able to define, evaluate, and compare functions displayed algebraically, graphically, or numerically in tables or by verbal descriptions as well as represent or interpret functional relationships between quantities using tables, graphs, and descriptions.

Unit Essential Question: How do you define, evaluate, and compare functions displayed algebraically, graphically, or numerically in tables or by verbal descriptions as well as represent or interpret functional relationships between quantities using tables, graphs, and descriptions?

Concept:	**Concept:**
Relations and Functions	Linear Functions
Lesson Essential Questions:	**Lesson Essential Questions:**
How do you represent relationships as tables, graphs, and equations? How do you determine the domain and range from a relation? How do you determine if a relation is a function?	How do you use a function to create a table and graph? How do you create a table or graph from special function rules? How do you create a function rule from a table or graph? How do you compare and evaluate linear functions? How do you determine the increasing, decreasing, and constant intervals from functions? How do you interpret qualitative graphs?

Vocabulary:
Relations, Functions, Domain, Range, Function Notation, Linear Function, Qualitative Graphs

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July 2022

Topic: Unit 7 – Data Analysis

Days: 13

KNOW:	UNDERSTAND:	DO:
Scatter Plot Line of Best Fit Correlation Two Way Tables	How to analyze and interpret bivariate data displayed in multiple representations.	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. Example: In a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.

Name: Unit 7 – Data Analysis
Grade: 8th Grade

Course/Subject: Math
School District: Central Columbia

Key Learning: Students will be able to analyze and interpret bivariate data displayed in multiple representations.

Unit Essential Question: How do you analyze and interpret bivariate data displayed in multiple representations?

Concept: Data Displays	**Concept:** Scatter Plots	**Concept:** Two Way Tables
Lesson Essential Question: How do you interpret various data displays?	**Lesson Essential Question:** How do you create scatter plots and make predictions? What are the special cases with scatter plots? How do you write equations for scatter plots?	**Lesson Essential Question:** How do you create and interpret two-way tables?

Vocabulary:
Scatter Plot, Line of Best Fit, Correlation, Two Way Table

CCSD Curriculum
Course: 8th Grade Math

July 2022

Topic: Unit 8 – Factoring

Days: 23

KNOW:	UNDERSTAND:	DO:
Multiple Least Common Multiple Factor Greatest Common Factor Polynomial Monomial Binomial Trinomial Constant Linear Quadratic Cubic FOIL Guess and Check Perfect Square Trinomial Difference of Squares Rational Expressions	How to multiply and factor polynomials using a variety of methods.	A1.1.1.5.1 Add, subtract, and/or multiply polynomial expressions (express answers in simplest form). Note: Nothing larger than a binomial multiplied by a trinomial. A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials. Note: Trinomials are limited to the form ax2 + bx + c where a is equal to 1 after factoring out all monomial factors. A1.1.1.5.3 Simplify/reduce a rational algebraic expression.

Name: Unit 8 – Factoring
Grade: 8th Grade

Course/Subject: Math
School District: Central Columbia

Key Learning: Students will be able to multiply and factor polynomials using a variety of methods.

Unit Essential Question: How do you multiply and factor polynomials using a variety of methods?

Concept: Characteristics of Polynomials	**Concept:** Factoring Polynomials
Lesson Essential Questions: How do you find the LCM and GCF between two numbers? How do you find the GCF between two algebraic expressions? How do you classify and multiply polynomials?	**Lesson Essential Questions:** How do you factor polynomials using the GCF? How do you multiply two binomials using the FOIL method? How do you factor trinomials using the Guess and Check method? How do you factor polynomials using special cases? How do you simplify rational expressions? How do you multiply polynomials using multiple steps? How do you apply polynomials to real life problems?

Vocabulary:
Multiple, Least Common Multiple, Factor, Greatest Common Factor, Polynomial, Monomial, Binomial, Trinomial, Constant, Linear, Quadratic, Cubic, FOIL, Guess and Check, Perfect Square Trinomial, Difference of Squares, Rational Expressions