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

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 23 days 2. One Variable Equations 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

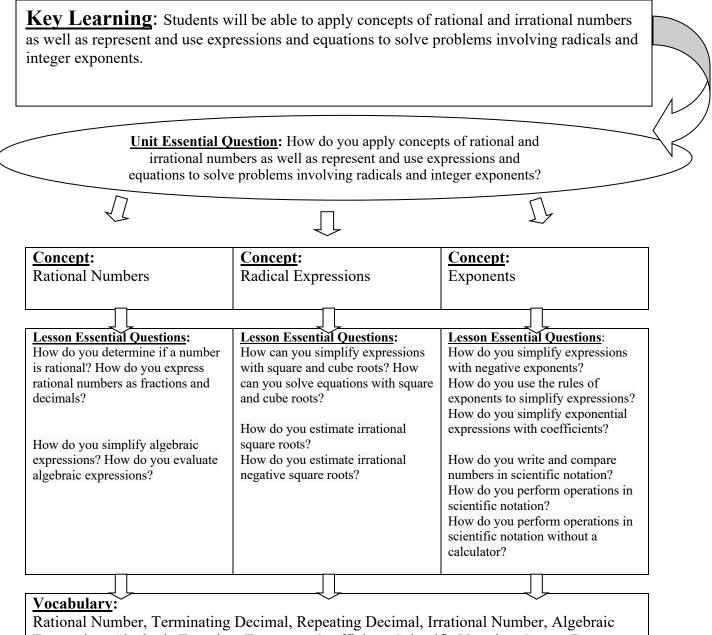
163 Days

Topic: Unit 1 – Real Numbers

KNOW:	UNDERSTAND:	DO:
Rational Number	How to apply concepts of rational	M08.A-N.1.1.1 Determine whether a number is rational or irrational. For rational numbers, show that the decimal expansion terminates or
Terminating Decimal	and irrational numbers as well as	repeats (limit repeating decimals to thousandths).
Repeating Decimal	represent and use expressions and	M08.A-N.1.1.2 Convert a terminating or repeating decimal to a rational number (limit repeating decimals to thousandths).
Irrational Number	equations to solve problems involving	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.
Algebraic Expression	radicals and integer exponents.	M08.A-N.1.1.4 Use rational approximations of irrational numbers to
Algebraic Equation		compare and order irrational numbers.
Exponent		M08.A-N.1.1.5 Locate/identify rational and irrational numbers at their approximate locations on a number line.
Coefficient Scientific Notation		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.
Square Root Perfect Square		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
Cube Root		including 53) without a calculator. Example: If $x^2 = 25$ then $x = \pm \sqrt{25}$.
Perfect Cube		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
Absolute Value		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).

Days: 20

Name: Unit 1 – Real Numbers Grade: 8th



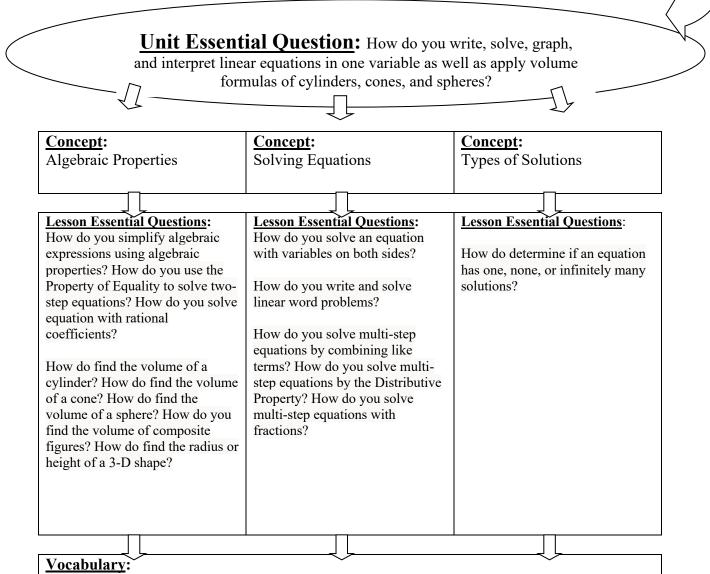
Expression, Algebraic Equation, Exponent, Coefficient, Scientific Notation, Square Root, Perfect Square, Cube Root, Perfect Cube, Absolute Value

KNOW:	UNDERSTAND:	DO:
Cylinder	How to write, solve, graph,	M08.B-E.3.1.1 Write and
	and interpret linear	identify linear equations in
Cone	equations in one variable as	one variable with one
Sphere	well as apply volume formulas of cones,	solution, infinitely many solutions, or no solutions.
Sphere	cylinders, and spheres.	Show which of these
Commutative Property	, , , , , , , , , , , , , , , , , , ,	possibilities is the case by
		successively transforming
Associative Property		the given equation into
Distributive Property		simpler forms until an equivalent equation of the
Distributive Toperty		form $x = a$, $a = a$, or $a = b$
Additive Identity		results (where a and b are
-		different numbers).
Multiplicative Identity		M08.B-E.3.1.2 Solve linear
Additive Inverse		equations that have rational
Additive inverse		number coefficients,
Multiplicative Inverse		including equations whose
		solutions require expanding
Multiplicative Property		expressions using the distributive property and
of Zero		collecting like terms.
Property of Equality		· · · · · · · · · · · · · · · · · · ·
1 5 1 5		M08.C-G.3.1.1 Apply
No Solution		formulas for the volumes of
Infinitaly Many Salutions		cones, cylinders, and spheres to solve real-world
Infinitely Many Solutions		and mathematical problems.
		Formulas will be provided.

Topic: Unit 2 – One Variable Equations

Days: 23

<u>**Key Learning**</u>: 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.

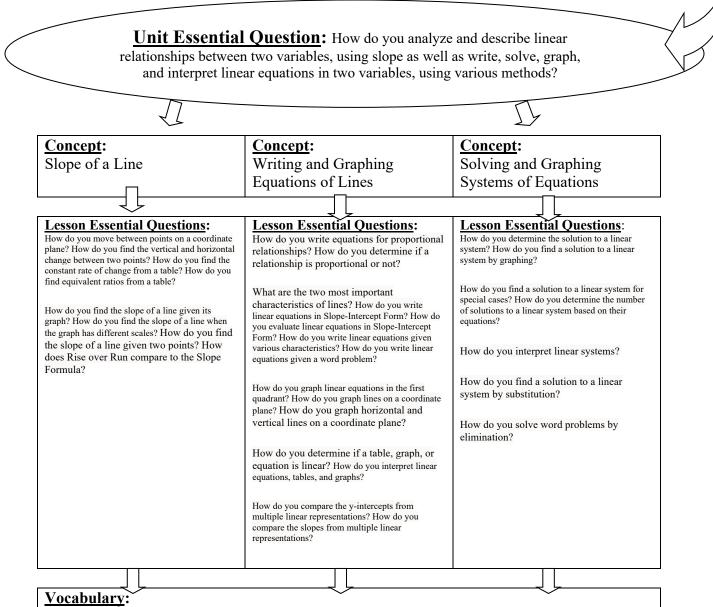


Cylinder, Cone, Sphere, Commutative Property, Associative Property, Distributive Property, Additive Identity, Multiplicative Identity, Additive Inverse, Multiplicative Inverse, Multiplicative Property of Zero, No Solution, Infinitely Many **Topic:** Unit 3 – Two Variable Equations

Days: 40

KNOW:	UNDERSTAND:	DO:
Constant Rate of Change Ratio	How to analyze and describe linear relationships between two variables, using	M08.B-E.2.1.1 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships
Slope	slope as well as write, solve, graph, and	represented in different ways. Example: Compare a distance-time graph to a distance-time equation to determine
Rise over Run Undefined	interpret linear equations in two variables, using various	which of two moving objects has greater speed.
Y-intercept	methods.	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
Linear Relationship		on a non-vertical line in the coordinate plane.
Proportional Horizontal Lines		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
Vertical Lines		intercepting the vertical axis at b.
Transformations		M08.B-E.3.1.3 Interpret solutions to a system of two linear equations in two variables as points of intersection of their
Linear Systems		graphs because points of intersection satisfy both equations simultaneously.
Solution to a System Intersecting Lines		M08.B-E.3.1.4 Solve systems of two linear equations in two variables algebraically and estimate solutions by
Parallel Lines		graphing the equations. Solve simple cases by inspection. Example: $3x + 2y = 5$
Coinciding Lines		and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.
Substitution		M08.B-E.3.1.5 Solve real-world and mathematical problems leading to two
Elimination		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.

<u>Key Learning</u>: 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.



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

Topic: Unit 4 – Geometric Transformations
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KNOW:	UNDERSTAND:	DO:
Transformation	How to apply properties of	M08.C-G.1.1.1 Identify and
	geometric transformations to	apply properties of rotations,
Translation	verify congruence or	reflections, and translations.
	similarity.	Example: Angle measures
Reflections		are preserved in
Rotations		rotations, reflections, and translations.
Rotations		translations.
Dilations		M08.C-G.1.1.2 Given two
		congruent figures, describe a
Enlargement		sequence of transformations
		that exhibits the congruence
Reduction		between them.
Scale Factor		M08.C-G.1.1.3 Describe the
Scale Factor		effect of dilations,
Congruence		translations, rotations, and
8		reflections on two-
Similarity		dimensional figures using
		coordinates.
Slope Triangles		
December 1 Discourse		M08.C-G.1.1.4 Given two similar two-dimensional
Proportional Figures		figures, describe a sequence
		of transformations that
		exhibits the similarity
		between them.

	tion: How do you apply properties of
	to verify congruence and similarity?
<u>Concept:</u> Geometric Transformations	Concept: Congruence and Similarity
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Lesson Essential Question:	Lesson Essential Question:
How do you identify congruent parts to congruent figures?	How do you determine congruent and similar parts to slope triangles formed from a line?
How do you perform and interpret geometric translations?	How do you identify and perform multiple transformations?
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?	

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

Topic: Unit 5 – Pythagorean Theorem	Days: 11
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KNOW:	UNDERSTAND:	DO:
Pythagorean Theorem	How to solve problems involving right	M08.C-G.2.1.1 Apply the converse of the Pythagorean
Hypotenuse	triangles by applying the Pythagorean theorem.	theorem to show a triangle is a right triangle.
Leg		
		M08.C-G.2.1.2 Apply the
Converse of the Pythagorean		Pythagorean theorem to
Theorem		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

<u>**Key Learning</u>**: Students will be able to solve problems involving right triangles by applying the Pythagorean Theorem.</u>

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

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<u>Concept:</u> 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

KNOW:	UNDERSTAND:	DO:
Relations	Define, evaluate,	M08.B-F.1.1.1 Determine whether a relation
Functions	and compare functions displayed algebraically,	is a function. M08.B-F.1.1.2 Compare properties of two
Domain	graphically, or numerically in	functions, each represented in a different way (i.e., algebraically, graphically, numerically
Range	tables or by verbal descriptions as well	in tables, or by verbal descriptions). Example: Given a linear function represented
Function Notation	as represent or interpret functional	by a table of values and a linear function represented by an algebraic expression,
Linear Function	relationships between quantities	determine which function has the greater rate of change.
Qualitative Graphs	using tables, graphs, and descriptions.	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

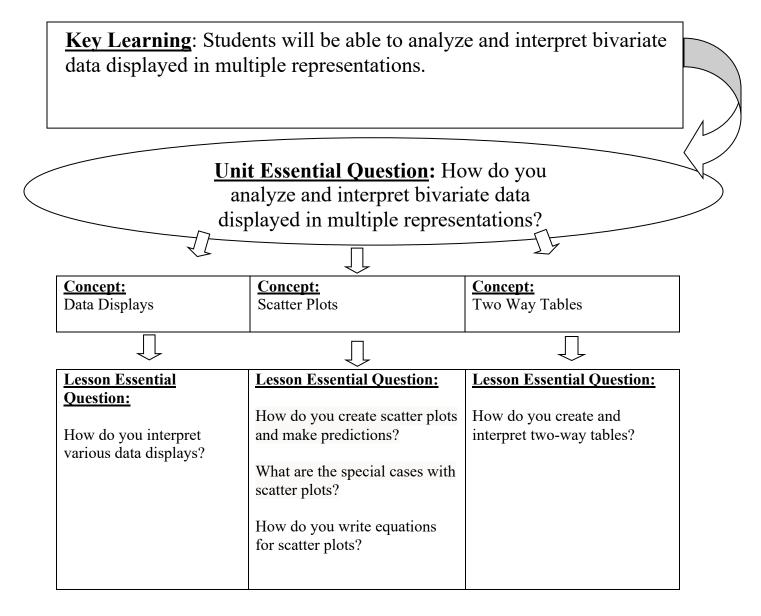
Key Learning: Students will be able to define, evaluate, and compare functions displayed algebraically, graphically, or numerically in tables or by verbal descriptions as well as represent or interpret functional relationships between quantities using tables, graphs, and descriptions. Unit Essential 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, How do you use a function to create a table graphs, and equations? and graph? How do you create a table or graph from special function rules? How do How do you determine the domain and range you create a function rule from a table or from a relation? graph? How do you determine if a relation is a How do you compare and evaluate linear functions? function? 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

Topic: Unit 7 – Data Analysis	Days: 13
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KNOW:	UNDERSTAND:	DO:
Scatter Plot	How to analyze and interpret	M08.D-S.1.1.1 Construct and
	bivariate data displayed in	interpret scatter plots for
Line of Best Fit	multiple representations.	bivariate measurement data to
		investigate patterns of
Correlation		association between two
		quantities. Describe patterns
Two Way Tables		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.
		plant neight.



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

Topic: Unit 8 – Factoring	Days: 23
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KNOW:	UNDERSTAND:	DO:
Multiple Least Common Multiple	How to multiply and factor polynomials using a variety of methods.	A1.1.1.5.1 Add, subtract, and/or multiply polynomial expressions (express
Factor		answers in simplest form). Note: Nothing larger than a binomial multiplied by a
Greatest Common Factor		trinomial.
Polynomial		A1.1.1.5.2 Factor algebraic expressions, including difference of squares and
Monomial		trinomials. Note: Trinomials are limited to the form ax2 +
Binomial		bx + c where a is equal to 1 after factoring out all
Trinomial		monomial factors.
Constant		A1.1.1.5.3 Simplify/reduce a rational algebraic
Linear		expression.
Quadratic		
Cubic		
FOIL		
Guess and Check		
Perfect Square Trinomial		
Difference of Squares		
Rational Expressions		

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: Concept:** Characteristics of Polynomials **Factoring Polynomials Lesson Essential Questions: Lesson Essential Questions:** How do you find the LCM and GCF How do you factor polynomials using the GCF? between two numbers? How do you multiply two binomials using the FOIL method? How do you find the GCF between two algebraic expressions? How do you factor trinomials using the Guess and Check method? How do you classify and multiply polynomials? 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